LAMONT-DOHERTY GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY
Palisades, New York

A PREDICTION OF SONIC PROPERTIES OF DEEP-SEA CORES, SOHM ABYSSAL PLAIN AND ENVIRONS

by

D. R. Horn, Maurice Ewing, M. N. Delach and B. M. Horn

Technical Report No. 2

CU-2-69 NAVSHIPS N00024-69-C-1184

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INTRODUCTION

Recent investigations of the ocean bottom suggest a fundamental relation exists between acoustic domains and major submarine physiographic and sedimentary provinces (Heezen et al., 1967; Markl et al., 1967; Hamilton, 1969a, 1969b, 1969c; Hamilton et al., 1969; and Horn et al., 1968b, 1969). Verification of the relationship is dependent upon adequate supporting data. Under the Marine Geophysical Survey Program of the U.S. Naval Oceanographic Office (Alpine Geophysical Associates, Inc., Atlantic Area I), 93 acoustic stations were successfully completed in the region of the Sohm Abyssal Plain. However, the Program collected only 16 sediment cores to which results of the acoustic survey can be referred. The purpose of the present study is to provide a fuller account of the bottom sediments using Lamont's cores from this part of the Atlantic.

Figure 1 shows the region surveyed under the MGS Program and the area described here. The latter is larger in order to include major sedimentary provinces within and around the abyssal plain. Lamont-Doherty Geological Observatory has collected 225 cores from the shaded area of Figure 1. This is an increase of control of at least a factor of ten over that of the MGS Program. With these additional data on hand, it may be possible to clarify the correlation of acoustic domains, bottom roughness and sediment type.

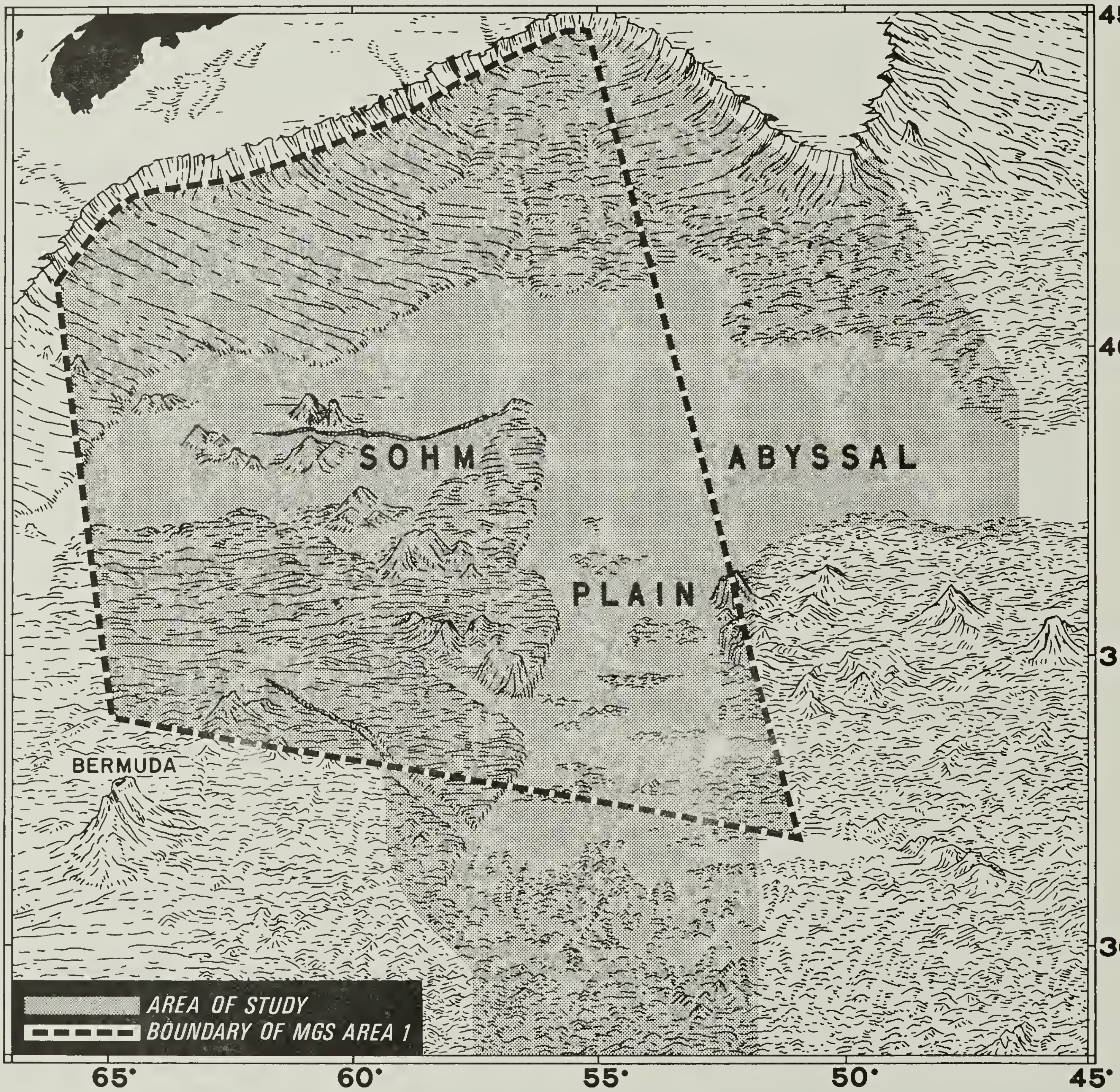

Figure 1. Index map showing locations of study area and MGS AREA 1, (Alpine Geophysical Associates) Northwest Atlantic. (Submarine physiography is from a portion of the Physiographic Diagram, Atlantic Ocean, published by The Geological Society of America. Copyright © 1957 by Bruce G. Heezen. Reproduced by permission.)

METHODS

Cores were taken by scientists and crews on research vessels of the Observatory under the direction of Professor Maurice Ewing. All were examined, 111 described and used to define limits of sedimentary provinces (Fig. 5), and 83 analyzed for texture. Forty-four of the latter were matched to 69 acoustic stations, some cores being related to more than one station (Fig. 4). Matching of cores to acoustic stations is based on both proximity and physiography. Specific data on each core are listed in the Appendices; whereas locations of acoustic and coring stations are plotted on Figures 4 and 5.

Diameter of the cores is 2 1/2 inches, and they range in length from 2 to 51 feet (average in area of report is 19 feet). A complete description of shipboard coring procedure and methods of core storage at the Observatory were given by Ericson et al. (1961). Methods of prediction of the acoustic properties and wet densities of cores has been previously stated by Horn et al. (1969b). It is repeated here for the sake of completeness and to allow the reader to evaluate the method of making the predictions.

Mean grain size is adopted as the index of speed at which sound travels through unconsolidated deep-sea sediments (Horn et al., 1968a, 1968b). Cores were first carefully described and sampled for textural analysis. Grain size measures were determined by the combined sieve-pipette technique outlined by Folk (1968). In short, gravel and sand

fractions were sieved through calibrated nests of 8-inch sieves at 1/4 phi intervals. Mud and clay were analyzed by the pipette method with aliquotes taken at 1/2 phi intervals.

Predictions of the speed at which sound travels through sediment (hereafter referred to as sound velocity or velocity) are based on laboratory measurements made in a separate program on cores from the North Atlantic and Mediterranean. Under the project, sound velocities were determined through linered cores which were immediately split and sampled at precise points where velocity measurements had been made. In this manner, it is now possible to match sound velocities to 562 determinations of mean grain size and 1093 of wet density (Figures 2 and 3). <u>All laboratory measurements of velocity are corrected to 23°C and a pressure of 1 atmosphere.</u> Least squares curves to the third order were fitted to these data by computer and predictions of velocities made at specific intervals of mean size and wet density. Appendix C lists velocities related to a range of mean grain size of 0.50 to 500 microns and wet densities of 1.18 to 2.28 g/cc. If these data are to be compared with <u>in situ</u> measurements they must first be adjusted to prevailing conditions of temperature and pressure (see Hamilton, 1963 and 1969c).

Predictions of wet densities and sound velocities of cores from the Sohm Abyssal Plain listed in Appendix D were determined in an indirect manner. The method used to arrive at the predictions has been

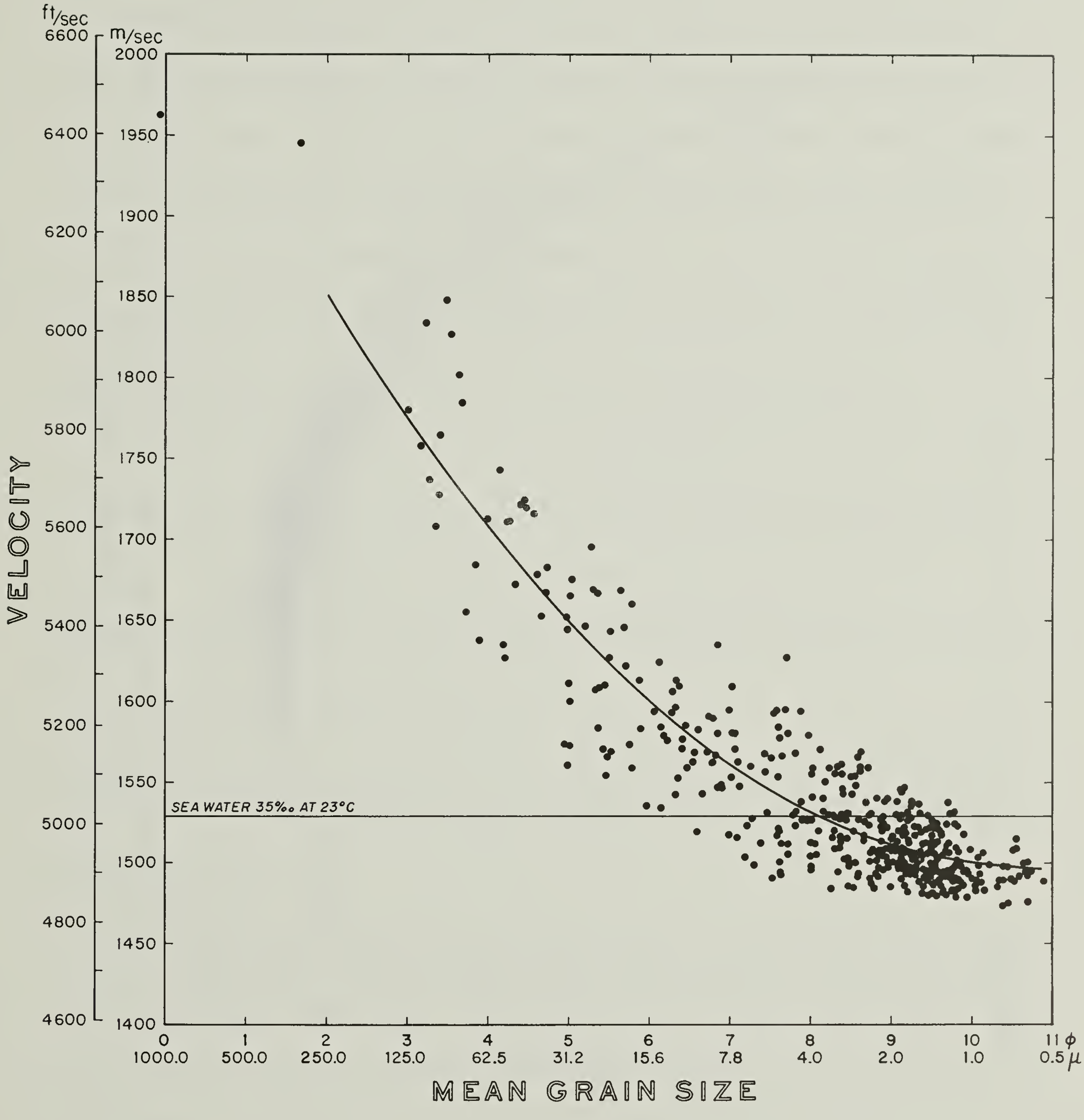

Figure 2. Mean grain size of unconsolidated deep-sea sediments plotted against sound velocity through sediment.

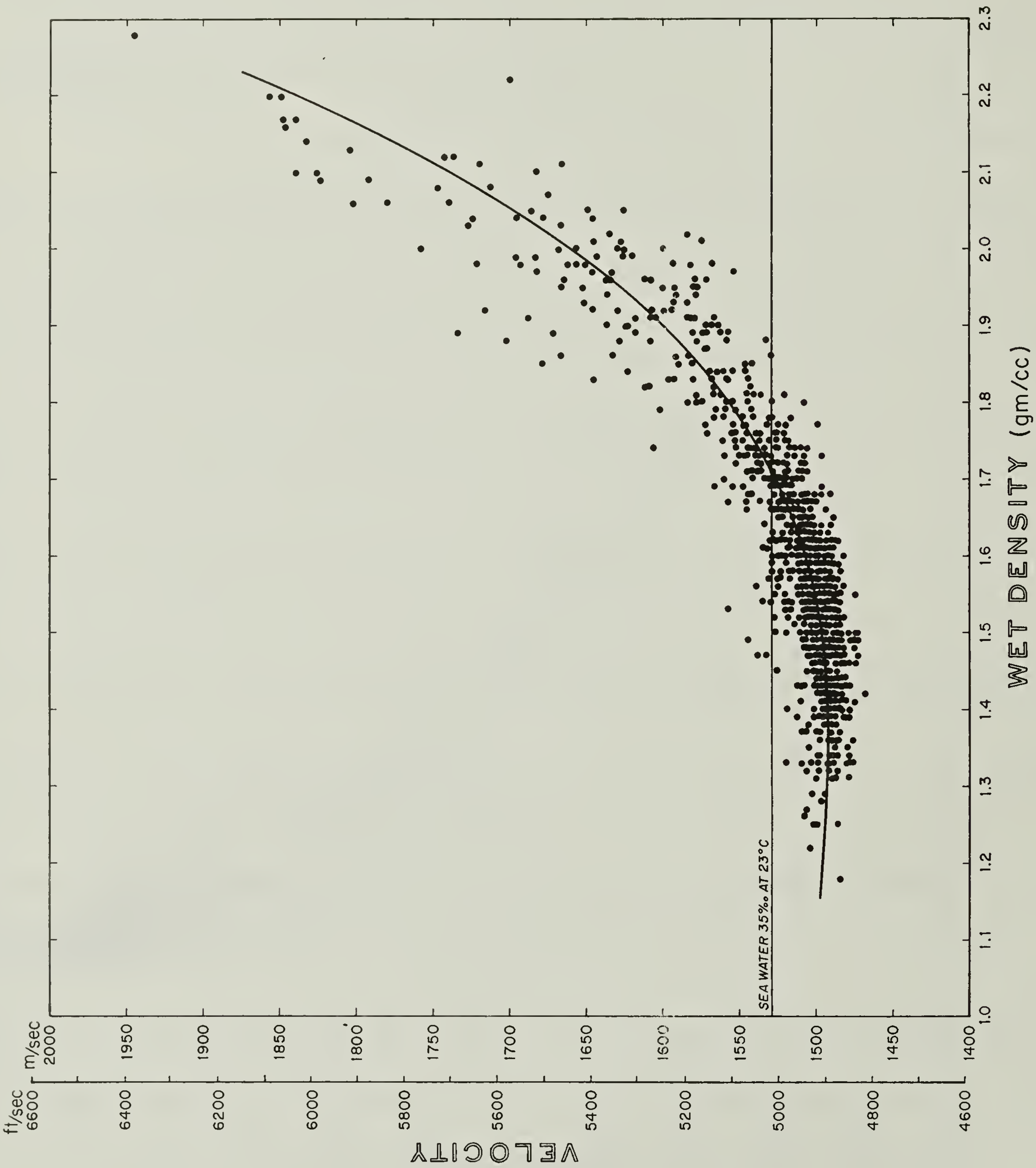

Figure 3. Wet density of unconsolidated deep-sea sediments plotted against sound velocity through sediment.

to conduct a mechanical analysis of a representative sample from a layer and determine its mean grain size. The value was then entered into the listing given in Appendix C and corresponding densities and velocities taken from the table. Results should be used with the understanding that they are only predictions. Undoubtedly there is error involved in following the route - mean grain size to sound velocity, then sound velocity to wet density. However, initial tests of these predictions have been made and afford confidence in the procedure.

Format of the report is such that the reader can locate an MGS station of interest or a core within his area of study by referring to Figures 4 and 5. After selecting a station or core, he can use Appendix D to obtain details of sediment lithology, and predictions of wet densities and sound velocities.

DISTRIBUTION OF SEDIMENT LAYERS CONSIDERED POTENTIAL REFLECTORS OF SOUND, SOHM ABYSSAL PLAIN AND ENVIRONS

General statement

The Sohm Abyssal Plain lies south of Nova Scotia and the Grand Banks. Descriptions of its topography and sediments are included in many earlier studies (examples are Heezen *et al.*, 1955, 1959; Heezen and Tharp, 1968; Ericson *et al.*, 1961; Hubert, 1964; Fruth, 1965). The plain is T - shaped with each of the arms and trunk of the T approximately 200 miles wide (Figs. 1, 4, and 5). Bottom gradients range from 1:1000 to 1:5000, and the floor is at depths between 2700 and

3000 fathoms (4938 to 5487 meters).

Cores from the plain are characterized by multiple sands and silts interstratified with clay. The deposits have been laid down by periodic and rapid addition of material by turbidity currents. Infilling and leveling have continued into the 20th century with the most recent contribution in 1929. That year the Grand Banks Earthquake initiated large scale transfer of terrigenous sediment from the continental margin to the neighboring plain (Heezen and Ewing, 1952; Heezen et al., 1954). Sand and coarse-grained silt emplaced by the turbidity flows, triggered by the earthquake, occur at the water-sediment interface. These and similar underlying deposits cover the Sohm Plain. They have high velocity-high wet density characteristics, present abrupt contrasts in acoustic impedence at or immediately below the water-sediment interface, and sound reflection should be at a maximum.

Sediment layers with the potential to reflect sound

In this report sand and silt layers of intermediate to high sound velocity and wet density are separated from associated low velocity-low wet density clays. Coarse layers possessing properties known to reflect sound are divided into four qualitative classes: 1) Good reflector -- >10 cm thick, 2) Intermediate reflector -- 5 to 10 cm thick, 3) Poor reflector -- <5 cm thick with clear-cut upper and lower limits, and 4) Questionable reflector -- <5 cm thick with poorly-defined limits. The position and thickness of the layers in the cores are given in

Appendix D. MGS acoustic stations are related to core data in Figure 4 and Appendix D.

A comparison of the distribution of potential reflectors with that of sand and silt reveals they are essentially the same (Figs. 4 and 5). The coarse-grained units have physical properties which produce sharp contrasts of acoustic impedence. The combination of a level sea floor and sediment with suitable acoustic properties suggests that sound reflection within the limits of the plain will be consistently high.

It is speculated that there will be a marked reduction of the level of sound reflection in areas of abyssal hills surrounding the Sohm Plain. South of the plain, cores consist of monotonous sections of brown clay and reflectors are extremely rare (Figs.4 and 5). Sound absorption rather than reflection should be the rule. There is no evidence of a large velocity contrast at the water-sediment interface. Where reflectors occur, they are limited to areas immediately adjacent to seamounts and consist of carbonate sand and silt which has slumped down the flanks of these submarine mountains.

Prediction of bottom reflectivity north of the Sohm Abyssal Plain is difficult. Core data are limited, and there are rapid changes of bottom roughness and sediment type. The small amount of data available suggest topographic lows and channels contain sand and silt; whereas areas of positive relief are covered with hemipelagic mud

and clay. Lows may contain potential reflectors; and divides presumably will be marked by high bottom loss. Large-scale variation in the level of sound reflection may make it impossible to predict the reflectivity in this region with any degree of certainty.

The dominant sediment of the continental slope and inner continental rise is greenish-gray, hemipelagic mud. Sand occurs both disseminated throughout the sediments and as poorly-defined, thin layers. The latter rarely are more than a few centimeters thick (Fig. 5). Lack of well-defined reflectors combined with rugged topography of the slope and inner continental rise suggest these provinces do not offer suitable acoustic interfaces for sound reflection.

Cores taken within the limits of the outer continental rise are predominantly clay interstratified with thin layers of coarser sediment (Figs. 4 and 5). The sands and silts generally are one to two centimeters thick but occasionally are of sufficient thickness to be potential reflectors. Although these units taken individually are thin, if combined they may have an additive effect which results in the reflection of sound. The numbers of coarse layers in the cores increases seaward across the outer continental rise. Increase in number and thickness of reflective layers combined with progressive decrease in bottom gradient and roughness toward the abyssal plain should be matched by a parallel seaward increase in the level of sound reflection.

CONCLUSIONS

Bottom and sub-bottom reflecting horizons occur throughout the Sohm Abyssal Plain. They consist of thick layers of sand and silt at or near the surface. The combination of highly reflective materials and favorable geometry suggests the plain offers an excellent acoustic interface for the reflection of sound. Reflection should be consistently high within the limits of the plain. Sand is widespread and constitutes a major portion of cores indicating that overall reflectivity of the Plain will be higher than encountered over much of the neighboring Hatteras Plain to the southwest.

Areas immediately south of the Sohm Plain are characterized by brown clay, reflectors are rare, and presumably sound will be absorbed rather than reflected. In addition, the rugged bottom relief will not favor reflection. North of the plain sediments are highly variable, bottom gradients steep, and topography rugged. The continental slope and inner continental rise do not appear to offer a suitable interface for sound reflection. Reflectivity will improve seaward across the outer continental rise as gradients decrease and the number and thickness of coarse layers increases.

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REFERENCES

Ericson, D. B., Ewing, M., Wollin, G., and B. C. Heezen, 1961; Atlantic deep-sea sediment cores: Geol. Soc. America Bull., v. 72, p. 193-286.

Folk, R. L., 1968; Petrology of sedimentary rocks: Hemphill's Book Store, Drawer M., University Station, Austin, Texas, 170 p.

Fruth, Jr., L. S., 1965; The 1929 Grand Banks turbidite and the sediments of the Sohm Abyssal Plain: New York, Columbia University, MA thesis, 258 p.

Hamilton, E. L., 1963; Sediment sound velocity measurements made in situ from bathyscaph Trieste: Jour. Geophys. Res., v. 68, no. 21, p. 5991-5998.

__________________ 1969a; Sound velocity, elasticity, and related properties of marine sediments, North Pacific. Part I: Sediment properties, environmental control, and empirical relationships. Naval Undersea Research and Development Center, San Diego, California, TP 143, 56 p.

__________________ 1969b; Sound velocity, elasticity, and related properties of marine sediments, North Pacific. Part II: Elasticity and elastic constants. Naval Undersea Research and Development Center, San Diego, California, TP 144.

__________________ 1969c; Sound velocity, elasticity and related properties of marine sediments, North Pacific. Part III: Prediction of in situ properties. Naval Undersea Research and Development Center, San Diego, California, TP 145, 79 p.

Hamilton, E. L., Bucker, H. P., Keir, D. L., and J. A. Whitney, 1969; In situ determinations of the velocities of compressional and shear waves in marine sediments from a research submersible: Naval Undersea Research and Development Center, San Diego, California, TP 163, 26 p.

Heezen, B. C., and Maurice Ewing, 1952; Turbidity currents and submarine slumps, and the 1929 Grand Banks earthquake: Am. Jour. Science, v. 250, p. 849-873.

Heezen, B. C., and Marie Tharp, 1968; Physiographic Diagram of the North Atlantic Ocean, revised: Geol. Soc. America, Boulder, Colorado.

Heezen, B. C., Ericson, D. B., and Maurice Ewing, 1954; Further evidence for a turbidity current following the 1929 Grand Banks earthquake: Deep-Sea Research, v. 1, p. 193-202.

Heezen, B. C., Ewing, Maurice, and D. B. Ericson, 1955; Reconnaissance survey of the abyssal plain south of Newfoundland: Deep-Sea Research, v. 2, p. 122-133.

Heezen, B. C., Geddes, W. H., and J. A. Ballard, 1967; Physiographic provinces and acoustic domains, p. 15-24, in Unpublished Rept., Office of Naval Research, Code 468.

Heezen, B. C., Tharp, Marie, and Maurice Ewing, 1959; The floors of the oceans, I. The North Atlantic: Geol. Soc. America, Spec. Paper 65, 122 p.

Horn, D. R., Horn, B. M., and M. N. Delach, 1968a; Correlation between acoustical and other physical properties of deep-sea cores: Jour. Geophys. Res., v. 73, no. 6, p. 1939-1957.

____________________ 1968b; Sonic properties of deep-sea cores from the North Pacific and their bearing on the acoustic provinces of the North Pacific: Lamont Geological Observatory, Palisades, New York. Tech. Rept. No. 10, CU-10-68 NAVSHIPS N00024-67-C-1186, 357 p.

Horn, D. R., Ewing, Maurice, Horn, B. M., and M. N. Delach, 1969; A prediction of sonic properties of deep-sea cores from the Hatteras Abyssal Plain and environs: Lamont-Doherty Geological Observatory, Palisades, New York. Tech. Rept. No. 1, CU-1-69 NAVSHIPS N00024-69-C-1184, 123 p.

Hubert, J. F., 1964; Textural evidence for deposition of many western North Atlantic deep-sea sands by ocean-bottom currents rather than turbidity currents: Jour. Geology, v. 72, p. 757-785.

Markl, R. G., Ewing, J. I., and G. M. Bryan, 1967; Delineation of sea floor roughness in the western North Atlantic: Lamont Geological Observatory, Palisades, New York. Tech. Rept. No. 2, CU-2-67 NAVSHIPS N00024-67-C-1186, 17 p.

APPENDIX A

CORE NUMBER, LOCATION, WATER DEPTH AND LENGTH OF CORE

Location, Depths and Lengths of Cores

MGS Area		Location		Water Depth		Core Length	
& Station	Core No.	Latitude	Longitude	Fathoms	Meters	Feet	Cm.
1-1	NO MATCHED CORE						
1-2	V4-2	36° 37' N	64° 27' W	2696	4931	29.2	890
1-3	NO MATCHED CORE						
1-4	NO MATCHED CORE						
1-5	V7-39	38° 47' N	64° 09' W	1756	3211	12.0	365
1-6	V17-210	39° 15' N	63° 09' W	2738	5008	13.3	404
1-7	NO MATCHED CORE						
1-8	V16-212	38° 36' N	58° 55' W	2855	5222	11.2	340
1-9	V23-9	39° 35' N	57° 40' W	2864	5238	20.0	610
1-10	V23-3	38° 26' N	57° 45' W	2846	5205	30.2	920
1-11	NO MATCHED CORE						
1-12	NO MATCHED CORE						
1-13	V22-234	36° 38' N	60° 33' W	2801	5123	40.2	1225
1-14	V22-234	36° 38' N	60° 33' W	2801	5123	40.2	1225

Location, Depths and Lengths of Cores

MGS Area & Station	Core No.	Location Latitude	Location Longitude	Water Depth Fathoms	Water Depth Meters	Core Length Feet	Core Length Cm.
1-15	V22-234	36° 38' N	60° 33' W	2801	5123	40.2	1225
1-16	V23-141	34° 25' N	60° 40' W	2615	4782	36.8	1120
1-24	A152-134	35° 54' N	62° 17' W	2777	5080	11.7	357
1-25	V20-250	35° 52' N	63° 33' W	2797	5115	38.2	1164
1-26	V4-2	36° 37' N	64° 27' W	2696	4931	29.2	890
1-27	V17-211	37° 04' N	62° 57' W	2748	5026	14.8	452
1-28	V22-234	36° 38' N	60° 33' W	2801	5123	40.2	1225
1-29	V22-234	36° 38' N	60° 33' W	2801	5123	40.2	1225
1-30	V7-57	38° 06' N	56° 45' W	3171	5800	20.1	612
1-31	V7-57	38° 06' N	56° 45' W	3171	5800	20.1	612
1-32	V7-56	38° 15' N	55° 15' W	2909	5321	8.0	245
1-33	NO MATCHED CORE						
1-34	NO MATCHED CORE						
1-35	V16-211	36° 18' N	57° 00' W	2879	5266	26.2	798

Location, Depths and Lengths of Cores

MGS Area		Location		Water Depth		Core Length	
& Station	Core No.	Latitude	Longitude	Fathoms	Meters	Feet	Cm.
1-36	V16-211	36° 18' N	57° 00' W	2879	5266	26.2	798
1-37	V19-312	35° 21' N	55° 27' W	2987	5464	33.5	1022
1-38	V19-312	35° 21' N	55° 27' W	2987	5464	33.5	1022
1-39	V7-58	35° 28' N	55° 48' W	2975	5442	20.1	612
1-40	NO MATCHED CORE						
1-41	NO MATCHED CORE						
1-42	NO MATCHED CORE						
1-43	V23-141	34° 25' N	60° 40' W	2615	4782	36.8	1120
1-45	V7-50	34° 46' N	52° 46' W	3015	5515	16.1	490
1-46	NO MATCHED CORE						
1-47	NO MATCHED CORE						
1-48	NO MATCHED CORE						
1-49	V7-50	34° 46' N	52° 46' W	3015	5515	16.1	490
1-50	V7-51	35° 25' N	53° 38' W	3001	5488	7.8	238

Location, Depths and Lengths of Cores

MGS Area & Station	Core No.	Location Latitude	Location Longitude	Water Depth Fathoms	Water Depth Meters	Core Length Feet	Core Length Cm.
1-51	V7-52	35° 43' N	53° 15' W	2992	5473	16.1	490
1-52	V23-8	40° 33' N	60° 11' W	2729	4991	38.3	1168
1-53	V18-375	39° 45' N	63° 32' W	2708	4953	11.2	340
1-54	V18-375	39° 45' N	63° 32' W	2708	4953	11.2	340
1-55	V18-375	39° 45' N	63° 32' W	2708	4953	11.2	340
1-57	NO MATCHED CORE						
1-58	V18-372	34° 50' N	65° 39' W	2781	5086	23.8	725
1-59	V20-250	35° 52' N	63° 33' W	2797	5115	38.2	1164
1-60	A152-133	35° 18' N	61° 44' W	2449	4480	8.0	245
1-61	V7-52	35° 43' N	53° 15' W	2992	5473	16.1	490
1-62	V7-54	37° 23' N	53° 22' W	2952	5400	2.0	245
1-63	V7-53	36° 54' N	54° 02' W	2967	5427	6.1	185
1-64	V7-55	37° 29' N	54° 53' W	2941	5380	16.1	490
1-65	V23-10	38° 38' N	54° 06' W	2908	5318	6.8	207

Location, Depths and Lengths of Cores

MGS Area & Station	Core No.	Location Latitude	Location Longitude	Water Depth Fathoms	Water Depth Meters	Core Length Feet	Core Length Cm.
1-66	A180-1	39° 08' N	54° 33' W	2838	5190	11.8	360
1-67	V7-44	39° 47' N	55° 44' W	2866	5242	7.1	215
1-68	V7-43	39° 27' N	56° 57' W	2863	5236	8.0	245
1-69	V7-43	39° 27' N	56° 57' W	2863	5236	8.0	245
1-70	V7-44	39° 47' N	55° 44' W	2866	5242	7.1	215
1-71	V7-44	39° 47' N	55° 44' W	2866	5242	7.1	215
1-72	V7-45	39° 52' N	54° 43' W	2851	5214	4.0	122
1-73	NO MATCHED CORE						
1-74	NO MATCHED CORE						
1-75	NO MATCHED CORE						
1-76	NO MATCHED CORE						
1-77	A164-47	41° 43' N	59° 00' W	2580	4719	2.3	71
1-78	NO MATCHED CORE						
1-79	NO MATCHED CORE						

Location, Depths and Lengths of Cores

MGS Area & Station	Core No.	Location		Water Depth		Core Length	
		Latitude	Longitude	Fathoms	Meters	Feet	Cm.
1-80	V2-4	43° 15' N	56° 17' W	2229	4076	12.8	390
1-81	V2-4	43° 15' N	56° 17' W	2229	4076	12.8	390
1-82	NO MATCHED CORE						
1-83	NO MATCHED CORE						
1-84	NO MATCHED CORE						
1-85	SP12-4	43° 04' N	60° 08' W	1340	2450	11.8	360
1-86	SP12-3	43° 11' N	59° 39' W	1300	2377	7.1	215
1-87	A164-54	42° 10' N	63° 21' W	1280	2341	14.5	441
1-88	A164-55	41° 47' N	62° 55' W	1820	3329	10.7	325
1-89	V16-213	41° 43' N	61° 55' W	2114	3866	35.4	1080
1-90	V23-7	41° 57' N	61° 24' W	2303	4212	9.4	286
1-91	A164-48	41° 35' N	59° 53' W	2550	4664	15.9	483
1-92	A164-47	41° 43' N	59° 00' W	2580	4719	2.3	71
1-93	A164-46	41° 24' N	59° 02' W	2610	4774	9.2	281

Location, Depths and Lengths of Cores

MGS Area & Station	Core No.	Location Latitude	Location Longitude	Water Depth Fathoms	Water Depth Meters	Core Length Feet	Core Length Cm.
1-94	V23-9	39° 35' N	57° 40' W	2864	5238	20.0	610
1-95	NO MATCHED CORE						
1-96	V23-8	40° 33' N	60° 11' W	2729	4991	38.0	1158
1-97	A164-46	41° 24' N	59° 02' W	2610	4774	9.2	281
1-98	V23-8	40° 33' N	60° 11' W	2729	4991	38.0	1158
1-99	V23-8	40° 33' N	60° 11' W	2729	4991	38.0	1158
1-100	V27-3	40° 40' N	62° 22' W	2586	4729	26.6	810
1-101	NO MATCHED CORE						
1-102	V7-68	40° 46' N	64° 36' W	2260	4133	8.0	245
1-103	V7-69	40° 46' N	65° 33' W	1626	2974	20.1	612

APPENDIX B

GRAIN SIZE DATA USED TO PREDICT SOUND VELOCITIES AND WET DENSITIES OF LAYERS FROM MEAN GRAIN SIZES OF SEDIMENTS

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-1	NO MATCHED CORE											
MGS 1-2, MGS 1-26												
V4-2	4931	30	0.00	1.72	50.91	47.37	.52	8.14	3.52	3.06	+.19	.43
		178	0.00	.02	28.22	71.76	.28	9.78	1.14	2.51	+.04	.43
		875	0.00	1.23	40.19	58.58	.41	9.03	1.91	2.83	+.14	.36
MGS 1-3	NO MATCHED CORE											
MGS 1-4	NO MATCHED CORE											
MGS 1-5												
V7-39	3211	9	0.04	83.86	9.42	6.68	.59	2.78	145.50	1.79	+.50	.73
		142	0.00	48.40	38.41	13.19	.74	4.54	42.80	2.48	+.48	.65
		335	20.36	73.44	3.03	3.17	.49	.33	791.00	1.79	+.18	.54

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-6												
V17-210	5008	35	0.00	16.20	33.86	49.94	.40	7.97	3.96	3.59	+.01	.44
		71	0.00	79.50	18.59	1.91	.91	3.57	83.60	.77	-.06	.68
		80	0.00	94.87	2.67	2.46	.52	2.93	130.90	.61	+.02	.51
		150	.66	95.29	2.00	2.05	.49	1.66	314.00	1.36	-.13	.46
		228	1.11	94.64	2.59	1.66	.61	1.68	310.00	1.46	-.22	.45
		275	.06	51.89	34.33	13.72	.71	4.45	45.50	2.85	+.41	.62
MGS 1-7	NO MATCHED CORE											
MGS 1-8												
V16-212	5222	12	0.00	1.41	30.47	68.12	.31	9.61	1.28	2.66	+.04	.44
		50	0.00	10.72	83.51	5.77	.94	5.56	21.09	1.64	+.20	.58
		90	0.00	95.07	2.18	2.75	.44	1.57	334.00	1.13	+.10	.54
		165	.62	88.69	4.50	6.19	.42	1.69	308.00	2.12	+.43	.68
		211	.44	89.77	3.83	5.96	.39	1.54	341.00	2.03	+.42	.70
		349	9.80	79.70	4.41	6.09	.42	.61	642.00	2.37	+.59	.70

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-9, MGS 1-94'												
V23-9	5238	132	0.00	84.00	14.09	1.91	.88	3.17	110.30	.91	+.38	.62
		515	0.00	83.53	14.33	2.14	.87	2.75	147.90	1.37	+.42	.57
MGS 1-10												
V23-3	5205	137	0.00	.03	94.74	5.23	.95	6.27	12.86	.76	+.25	.58
		187	0.00	.08	89.66	10.26	.90	6.44	11.43	1.33	+.41	.72
		402	0.00	.13	39.67	60.20	.40	8.87	2.12	3.12	-.02	.44
		593	0.00	.01	27.02	72.97	.27	9.86	1.08	2.36	+.10	.42
		600	0.00	.03	87.26	12.71	.87	6.46	11.35	1.38	+.49	.71
		912	0.00	.18	94.90	4.92	.95	5.80	17.94	.85	+.21	.58
MGS 1-11	NO MATCHED CORE											
MGS 1-12	NO MATCHED CORE											

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-13, MGS 1-14, MGS 1-15, MGS 1-28, MGS 1-29												
V22-234	5123	0	0.00	36.50	39.54	23.96	.62	6.03	15.26	3.06	+.50	.50
		715	0.00	.32	43.57	56.11	.44	8.99	1.96	2.80	+.18	.43
		1050	0.00	1.70	39.75	58.55	.40	8.81	2.22	3.07	+.04	.44
MGS 1-16, MGS 1-43												
V23-141	4782	0	0.00	.30	57.68	42.02	.58	7.60	5.13	3.10	+.19	.43
		170	0.00	.60	32.30	67.10	.32	9.49	1.38	2.71	+.04	.44
		1080	0.00	.32	32.76	66.92	.33	9.40	1.47	2.69	+.07	.46
MGS 1-24												
A152-134	5080	10	0.00	.35	23.89	75.76	.24	10.23	.83	2.76	-.26	.45
MGS 1-25, MGS 1-59												
V20-250	5115	11	0.00	.12	33.98	65.90	.34	9.54	1.34	2.74	+.02	.46
		635	0.00	.06	43.23	56.71	.43	9.06	1.86	2.83	+.15	.42
		1056	0.00	.26	80.39	19.35	.81	6.75	9.24	2.08	+.64	.66

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-27												
V17-211	5026	162	0.00	.08	82.25	17.67	.82	6.98	7.90	1.45	+.57	.66
		446	0.00	.30	91.83	7.87	.92	5.56	21.09	1.17	+.44	.67
MGS 1-30, MGS 1-31												
V7-57	5800	29	0.00	.21	49.89	49.90	.50	8.40	2.93	2.62	+.25	.48
MGS 1-32												
V7-56	5321	10	0.00	.02	79.75	20.23	.80	6.70	9.61	2.09	+.71	.62
		60	0.00	.04	48.76	51.20	.49	8.54	2.67	2.85	+.21	.45
		136	0.00	2.74	89.13	8.13	.92	5.59	20.71	1.42	+.36	.70
		233	0.00	4.16	93.72	2.12	.98	4.83	35.00	.56	+.21	.53
MGS 1-33	NO MATCHED CORE											
MGS 1-34	NO MATCHED CORE											
MGS 1-35, MGS 1-36												
V16-211	5266	780	0.00	.01	20.60	79.39	.21	10.41	.73	2.57	-.22	.46

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-37, MGS 1-38												
V19-312	5464	45	0.00	.01	92.75	7.24	.93	6.18	13.76	1.13	+.38	.74
		214	0.00	.40	37.79	61.81	.38	9.15	1.75	2.65	+.11	.46
		410	0.00	3.70	89.81	6.49	.93	5.14	28.29	1.28	+.43	.72
		475	0.00	.04	95.06	4.90	.95	6.06	14.91	.76	+.25	.59
		693	0.00	.01	13.90	86.09	.14	10.40	.74	2.12	+.08	.44
		720	0.00	.24	95.69	4.07	.96	5.88	16.98	.85	+.12	.55
		932	0.00	.11	80.06	19.83	.80	6.89	8.43	2.05	+.59	.63

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-39												
V7-58	5442	25	0.00	.12	47,84	52.04	.48	8.36	3.03	3.21	+.13	.36
		158	0.00	.01	94.64	5.35	.95	6.11	14.44	.96	+.12	.64
		390	0.00	.01	17.44	82.55	.17	10.31	.79	2.22	+.05	.42
		477	0.00	2.32	92.80	4.88	.95	5.50	22.04	1.23	+.31	.52
MGS 1-40	NO MATCHED CORE											
MGS 1-41	NO MATCHED CORE											
MGS 1-42	NO MATCHED CORE											
MGS 1-45, MGS 1-49												
V7-50	5515	40	0.00	1.86	36.01	62.13	.37	9.14	1.76	2.74	+.11	.46
		124	0.00	46.10	46.09	7.81	.86	4.21	53.70	1.71	+.33	.67
		241	0.00	11.77	40.05	48.18	.45	7.95	4.03	3.36	+.10	.42
		260	0.00	58.40	35.95	5.65	.86	3.98	63.00	1.27	+.41	.71
		343	0.00	70.20	25.21	4.59	.85	3.42	92.90	1.44	+.17	.61
		443	0.00	85.12	11.94	2.94	.80	2.73	150.00	1.45	+.21	.57

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-46	NO MATCHED CORE											
MGS 1-47	NO MATCHED CORE											
MGS 1-48	NO MATCHED CORE											
MGS 1-50												
V7-51	5488	30	0.00	.25	36.66	63.09	.37	9.30	1.57	2.59	+.17	.44
		70	0.00	40.80	54.66	4.54	.92	4.14	56.30	1.00	+.06	.65
		197	0.00	81.90	16.30	1.80	.90	3.47	90.00	.60	+.15	.53
		230	0.00	91.20	7.46	1.34	.85	2.81	141.90	.87	+.07	.51
		237	0.00	92.01	6.47	1.52	.81	2.57	168.00	.89	+.21	.49

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-51, MGS 1-61												
V7-52	5473	0	0.00	.62	50.76	48.62	.51	8.53	2.69	2.76	+.31	.45
		46	0.00	53.70	42.56	3.74	.92	3.99	62.70	1.02	+.22	.61
		71	0.00	81.89	15.17	2.94	.84	3.18	109.80	1.02	+.25	.54
		142	0.00	81.54	15.39	3.07	.83	2.82	141.20	1.37	+.30	.53
		167	0.00	81.72	14.80	3.48	.81	2.67	156.70	1.57	+.26	.53
		301	0.00	62.71	28.93	8.36	.78	3.86	68.70	2.25	+.44	.64
		325	0.00	68.50	23.37	8.13	.74	3.63	80.30	2.23	+.40	.63
		405	0.00	36.00	51.52	12.48	.81	4.93	32.70	2.46	+.31	.59
		437	0.00	61.94	30.80	7.26	.81	3.73	75.30	2.38	+.33	.61
		461	.08	4.82	54.97	40.13	.58	7.72	4.73	3.08	+.34	.43

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-52, MGS 1-96, MGS 1-98, MGS 1-99												
V23-8	4991	40	0.00	36.22	58.79	4.99	.92	4.36	48.30	1.00	+.63	.71
		595	0.00	.02	86.72	13.26	.87	7.02	7.66	1.23	+.48	.71
		630	0.00	.18	34.09	65.73	.34	9.05	1.88	3.28	-.18	.35
		659	0.00	.03	89.12	10.85	.89	6.69	9.64	1.27	+.47	.69
		1131	1.11	93.69	3.23	1.97	.62	2.36	193.80	.89	+.04	.49
MGS 1-53, MGS 1-54, MGS 1-55												
V.18-375	4953	40	0.00	10.80	83.13	6.07	.93	4.64	39.90	1.21	+.54	.78
		152	.01	86.47	9.61	3.91	.71	3.12	114.70	1.51	+.55	.48
		210	1.10	88.70	6.60	3.60	.65	2.56	168.70	1.22	+.35	.61
		255	0.00	50.79	45.34	3.87	.92	4.00	62.50	.66	+.31	.67
		315	0.00	2.07	34.31	63.62	.35	9.24	1.65	2.97	-.01	.44
MGS 1-57	NO MATCHED CORE											

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-58												
V18-372	5086	0	0.00	1.43	40.75	57.82	.41	8.91	2.07	2.77	+.16	.44
		372	0.00	.05	39.98	59.97	.40	9.04	1.90	2.95	+.03	.44
MGS 1-60												
A152-133	4480	15	0.00	1.13	34.63	64.24	.35	9.30	1.58	2.63	+.10	.45
MGS 1-62												
V7-54	5400	70	0.00	1.03	89.78	9.19	.91	5.44	22.98	1.63	+.51	.65
		160	0.00	.92	90.42	8.66	.91	5.40	25.51	1.48	+.55	.65
MGS 1-63												
V7-53	5427	15	0.00	.37	48.51	51.12	.49	8.61	2.54	2.71	+.27	.45
		69	0.00	87.49	8.87	3.64	.71	3.05	119.90	1.07	+.35	.64
		125	0.00	78.73	14.89	6.38	.70	3.33	98.90	1.67	+.51	.72
		169	0.00	82.69	11.31	6.00	.65	2.98	125.80	1.64	+.51	.70

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-64												
V7-55	5380	0	0.00	.18	43.03	56.79	.43	9.05	1.88	2.53	+.33	.45
		129	0.00	23.67	72.84	3.49	.95	4.86	34.10	1.10	+.07	.50
		196	.18	60.61	23.05	16.16	.59	4.40	47.20	3.14	+.60	.55
		322	0.00	25.85	38.11	36.04	.51	7.02	7.66	3.40	+.33	.43
		360	0.00	67.71	18.74	13.55	.58	3.36	96.90	3.37	+.54	.52
		377	.25	70.03	17.87	11.85	.60	3.01	123.20	3.26	+.54	.53

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K_G'
MGS 1-65												
V23-10	5318	16	0.00	22.82	74.73	2.45	.97	4.34	49.30	.55	+.25	.59
		83	0.00	86.33	12.23	1.44	.89	3.55	85.10	.46	+.35	.57
		140	0.00	90.30	8.33	1.37	.86	3.09	116.80	.65	+.28	.54
		190	0.00	91.80	6.82	1.38	.83	2.51	175.10	.88	+.42	.55
MGS 1-66												
A180-1	5190	10	0.00	34.59	60.61	4.80	.93	4.49	44.20	1.01	+.60	.63
		60	0.00	45.05	51.09	3.86	.92	4.15	56.10	.79	+.57	.70
		127	0.00	53.62	43.14	3.24	.93	4.09	58.50	.66	+.51	.70
		139	0.00	1.81	70.64	27.55	.72	6.70	9.57	2.46	+.54	.49
MGS 1-67, MGS 1-70, MGS 1-71												
V7-44	5242	0	0.00	.93	92.44	6.63	.93	5.33	24.80	1.13	+.50	.72
		118	0.00	7.57	90.00	2.43	.97	4.44	45.80	.50	+.29	.58
		163	0.00	11.00	58.34	30.66	.66	6.87	8.52	3.24	+.40	.52

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K_G'
MGS 1-68, MGS 1-69												
V7-43	5236	0	0.00	15.75	72.27	11.98	.86	5.47	22.50	2.09	+.25	.71
		30	.01	78.99	17.11	3.89	.81	3.05	120.40	1.70	+.39	.64
		111	0.00	81.80	15.75	2.45	.87	2.88	135.50	1.32	+.32	.58
		177	0.00	89.30	8.52	2.18	.80	2.48	179.20	1.10	+.34	.59
		236	0.00	89.90	7.30	2.80	.72	2.44	183.40	1.22	+.22	.57
MGS 1-72												
V7-45	5214	10	0.00	10.40	85.36	4.24	.95	4.80	35.80	.93	+.36	.60
		110	.31	50.28	47.21	2.20	.96	4.15	55.90	.59	+.52	.61
MGS 1-73	NO MATCHED CORE											
MGS 1-74	NO MATCHED CORE											
MGS 1-75	NO MATCHED CORE											
MGS 1-76	NO MATCHED CORE											

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K_G'
MGS 1-77, MGS 1-92												
A164-47	4719	18	0.00	.53	45.02	54.45	.45	8.32	3.12	3.06	+.05	.42
		32	0.00	86.90	10.87	2.23	.83	3.47	89.80	.50	+.21	.57
		50	0.00	.54	26.50	72.96	.27	9.83	1.10	2.46	+.07	.44
MGS 1-78	NO MATCHED CORE											
MGS 1-79	NO MATCHED CORE											
MGS 1-80, MGS 1-81												
V2-4	4076	0	0.00	.01	33.70	66.29	.34	9.46	1.42	2.80	+.02	.44
		370	0.00	.02	48.02	51.96	.48	8.61	2.54	3.30	+.01	.35
MGS 1-82	NO MATCHED CORE											
MGS 1-83	NO MATCHED CORE											
MGS 1-84	NO MATCHED CORE											
MGS 1-85												
SP12-4	2450	25	0.00	1.93	47.68	50.39	.49	8.14	3.53	3.10	+.09	.40

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-86												
SP12-3	2377	8	0.00	6.49	40.71	52.80	.44	8.31	3.14	3.37	.00	.46
		200	0.00	4.73	38.55	56.72	.40	8.46	2.82	3.33	-.03	.45
MGS 1-87												
A164-54	2341	0	5.14	20.24	35.80	38.82	.48	6.97	7.95	4.31	-.02	.49
		400	3.60	21.74	35.98	38.68	.48	7.00	7.81	4.13	+.04	.47
MGS 1-88												
A164-55	3329	60	5.18	17.78	33.85	43.19	.44	7.32	6.21	4.38	-.06	.49
MGS 1-89												
V16-213	NOT ANALYZED											
MGS 1-90												
V23-7	4212	0	0.00	2.42	45.11	52.47	.46	8.46	2.83	2.91	+.14	.47
		275	0.00	.57	29.59	69.84	.30	9.70	1.20	2.52	+.11	.43

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-91												
A164-48	4664	18	0.00	3.65	72.20	24.15	.75	6.35	12.20	2.59	+.70	.52
		189	0.00	.02	29.82	70.16	.30	9.71	1.19	2.46	+.11	.43
		191	0.00	.03	81.79	18.18	.82	6.64	10.02	1.96	+.65	.66
MGS 1-93, MGS 1-97												
A164-46	4774	35	0.00	76.60	21.11	2.29	.90	3.65	79.60	.58	+.06	.56
		100	0.00	1.27	29.41	69.32	.30	9.33	1.55	3.04	-.13	.47
		138	0.00	1.69	92.12	6.19	.94	5.52	21.69	1.29	+.39	.69
		139	0.00	.64	90.01	9.35	.91	5.81	17.82	1.50	+.34	.67
MGS 1-95	NO MATCHED CORE											
MGS 1-100												
V27-3	4729	30	0.00	5.85	45.97	48.18	.49	8.20	3.39	3.20	+.15	.46
		76	0.00	41.50	56.97	1.53	.97	4.10	58.30	.66	+.17	.56
		506	0.00	.18	37.98	61.84	.38	9.79	1.13	2.52	+.04	.42
		659	0.00	86.81	11.22	1.97	.85	3.45	91.50	.54	+.14	.62

GRAIN SIZE DATA

Core No.	Depth (m)	Depth in Core(cm)	% Gravel	% Sand	% Silt	% Clay	$\frac{z}{z+c}$	Mz ϕ	Mz μ	σ_I	Sk_I	K'_G
MGS 1-101	NO MATCHED CORE											
MGS 1-102												
V7-68	4133	35	0.00	9.00	37.48	53.52	.41	8.38	2.99	3.37	-.02	.46
		141	25.19	73.93	.88			-0.05	1042.00	1.25	+.34	.46
		165	.43	98.46	.34	.77	.31	1.56	338.00	.67	.00	.44
		219	45.93	50.79	3.28			-0.61	1526.00	2.00	+.05	.44
MGS 1-103												
V7-69	2974	25	.29	24.01	39.06	36.64	.52	6.84	8.68	3.45	+.29	.45
		468	0.00	4.21	56.08	39.71	.59	7.65	4.95	3.03	+.33	.45

APPENDIX C

TABLE OF PREDICTED SOUND VELOCITIES AND WET DENSITIES BASED UPON MEAN GRAIN SIZES OF SEDIMENTS (ALL DATA ARE ADJUSTED TO 23° CENTIGRADE)

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1497	4911	-	1.18-1.19
1496	4907	0.50	1.20-1.22
1495	4905	-	1.23-1.25
1494	4902	-	1.26-1.29
1493	4898	-	1.30-1.34
1492	4895	-	1.35-1.41
1493	4898	-	1.42-1.45
1494	4902	-	1.46-1.48
1495	4906	0.75	1.49
1497	4911	1.00	1.52
1500	4920	1.25	1.55
1502	4929	1.50	1.57
1505	4939	1.75	1.60
1508	4948	2.0	1.62
1514	4967	2.5	1.65
1519	4985	3.0	1.68
1525	5002	3.5	1.70
1529	5018	4.0	1.72
1538	5047	5.0	1.75
1546	5073	6.0	1.78
1554	5097	7.0	1.80
1560	5119	8.0	1.81
1566	5139	9.0	1.83
1572	5158	10.0	1.84
1578	5176	11.0	1.86
1583	5193	12.0	1.87
1588	5208	13.0	1.88

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1592	5223	14.0	1.89
1596	5238	15.0	1.89
1601	5251	16.0	1.90
1605	5264	17.0	1.91
1608	5277	18.0	1.92
1612	5289	19.0	1.92
1616	5300	20.0	1.93
1619	5311	21.0	1.94
1622	5322	22.0	1.94
1625	5333	23.0	1.95
1628	5343	24.0	1.95
1631	5353	25.0	1.96
1634	5362	26.0	1.96
1637	5371	27.0	1.97
1640	5380	28.0	1.97
1643	5389	29.0	1.98
1645	5398	30.0	1.98
1648	5406	31.0	1.98
1651	5414	32.0	1.99
1653	5422	33.0	1.99
1655	5430	34.0	1.99
1657	5437	35.0	2.00
1660	5445	36.0	2.00
1662	5452	37.0	2.00
1664	5459	38.0	2.01
1666	5466	39.0	2.01
1668	5473	40.0	2.01

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc	Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1670	5479	41.0	2.02	1714	5625	68.0	2.07
1672	5486	42.0	2.02	1716	5629	69.0	2.07
1674	5492	43.0	2.02	1717	5634	70.0	2.08
1676	5499	44.0	2.02	1718	5638	71.0	2.08
1678	5505	45.0	2.03	1720	5642	72.0	2.08
1680	5511	46.0	2.03	1721	5647	73.0	2.08
1682	5517	47.0	2.03	1722	5651	74.0	2.08
1683	5523	48.0	2.03	1724	5655	75.0	2.08
1685	5529	49.0	2.04	1725	5659	76.0	2.09
1687	5535	50.0	2.04	1726	5663	77.0	2.09
1689	5540	51.0	2.04	1727	5667	78.0	2.09
1690	5546	52.0	2.04	1729	5671	79.0	2.09
1692	5551	53.0	2.04	1730	5675	80.0	2.09
1694	5557	54.0	2.05	1731	5679	81.0	2.09
1695	5562	55.0	2.05	1732	5683	82.0	2.09
1697	5567	56.0	2.05	1733	5687	83.0	2.09
1698	5572	57.0	2.05	1734	5690	84.0	2.10
1700	5577	58.0	2.06	1736	5694	85.0	2.10
1702	5583	59.0	2.06	1737	5698	86.0	2.10
1703	5587	60.0	2.06	1738	5701	87.0	2.10
1705	5592	61.0	2.06	1739	5705	88.0	2.10
1706	5597	62.0	2.06	1740	5709	89.0	2.10
1707	5602	63.0	2.06	1741	5712	90.0	2.10
1709	5607	64.0	2.07	1742	5716	91.0	2.10
1710	5611	65.0	2.07	1743	5719	92.0	2.11
1712	5616	66.0	2.07	1744	5723	93.0	2.11
1713	5620	67.0	2.07	1745	5726	94.0	2.11

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc	Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1746	5730	95.0	2.11	1772	5812	122.0	2.14
1747	5733	96.0	2.11	1772	5815	123.0	2.14
1748	5736	97.0	2.11	1773	5818	124.0	2.14
1749	5740	98.0	2.11	1774	5821	125.0	2.14
1750	5743	99.0	2.11	1775	5823	126.0	2.14
1751	5746	100.0	2.11	1776	5826	127.0	2.14
1752	5750	101.0	2.11	1777	5829	128.0	2.14
1753	5753	102.0	2.12	1777	5831	129.0	2.14
1754	5756	103.0	2.12	1778	5834	130.0	2.14
1755	5759	104.0	2.12	1779	5837	131.0	2.14
1756	5762	105.0	2.12	1780	5839	132.0	2.14
1757	5765	106.0	2.12	1781	5842	133.0	2.14
1758	5768	107.0	2.12	1781	5844	134.0	2.14
1759	5772	108.0	2.12	1782	5847	135.0	2.15
1760	5775	109.0	2.12	1783	5849	136.0	2.15
1761	5778	110.0	2.12	1784	5852	137.0	2.15
1762	5781	111.0	2.13	1784	5854	138.0	2.15
1763	5784	112.0	2.13	1785	5857	139.0	2.15
1764	5787	113.0	2.13	1786	5859	140.0	2.15
1765	5789	114.0	2.13	1787	5862	141.0	2.15
1766	5792	115.0	2.13	1787	5864	142.0	2.15
1766	5795	116.0	2.13	1788	5867	143.0	2.15
1767	5797	117.0	2.13	1789	5869	144.0	2.15
1768	5801	118.0	2.13	1790	5872	145.0	2.15
1769	5804	119.0	2.13	1790	5874	146.0	2.15
1770	5807	120.0	2.13	1791	5876	147.0	2.15
1771	5810	121.0	2.13	1792	5879	148.0	2.16

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc	Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1793	5881	149.0	2.16	1811	5940	176.0	2.17
1793	5883	150.0	2.16	1811	5942	177.0	2.17
1794	5886	151.0	2.16	1812	5944	178.0	2.18
1795	5888	152.0	2.16	1812	5946	179.0	2.18
1795	5890	153.0	2.16	1813	5948	180.0	2.18
1796	5893	154.0	2.16	1814	5950	181.0	2.18
1797	5895	155.0	2.16	1814	5952	182.0	2.18
1797	5897	156.0	2.16	1815	5954	183.0	2.18
1798	5900	157.0	2.16	1815	5956	184.0	2.18
1799	5902	158.0	2.16	1816	5958	185.0	2.18
1800	5904	159.0	2.16	1817	5960	186.0	2.18
1800	5906	160.0	2.16	1817	5962	187.0	2.18
1801	5908	161.0	2.16	1818	5964	188.0	2.18
1802	5911	162.0	2.16	1818	5966	189.0	2.18
1802	5913	163.0	2.16	1819	5968	190.0	2.18
1803	5915	164.0	2.17	1820	5970	191.0	2.18
1804	5917	165.0	2.17	1820	5972	192.0	2.18
1804	5919	166.0	2.17	1821	5974	193.0	2.18
1805	5921	167.0	2.17	1821	5976	194.0	2.18
1806	5924	168.0	2.17	1822	5977	195.0	2.18
1806	5926	169.0	2.17	1823	5979	196.0	2.18
1807	5928	170.0	2.17	1823	5981	197.0	2.19
1808	5930	171.0	2.17	1824	5983	198.0	2.19
1808	5932	172.0	2.17	1824	5985	199.0	2.19
1809	5934	173.0	2.17	1825	5987	200.0	2.19
1809	5936	174.0	2.17	1825	5989	201.0	2.19
1810	5938	175.0	2.17	1826	5990	202.0	2.19

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc	Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1826	5992	203.0	2.19	1841	6039	230.0	2.20
1827	5994	204.0	2.19	1841	6040	231.0	2.20
1828	5996	205.0	2.19	1842	6042	232.0	2.20
1828	5998	206.0	2.19	1842	6044	233.0	2.20
1829	5999	207.0	2.19	1843	6045	234.0	2.20
1829	6001	208.0	2.19	1843	6047	235.0	2.20
1830	6003	209.0	2.19	1844	6048	236.0	2.21
1830	6005	210.0	2.19	1844	6050	237.0	2.21
1831	6006	211.0	2.19	1845	6052	238.0	2.21
1831	6008	212.0	2.19	1845	6053	239.0	2.21
1832	6010	213.0	2.19	1845	6055	240.0	2.21
1832	6012	214.0	2.19	1846	6056	241.0	2.21
1833	6013	215.0	2.20	1846	6058	242.0	2.21
1833	6015	216.0	2.20	1847	6059	243.0	2.21
1834	6017	217.0	2.20	1847	6061	244.0	2.21
1834	6019	218.0	2.20	1848	6063	245.0	2.21
1835	6020	219.0	2.20	1848	6064	246.0	2.21
1836	6022	220.0	2.20	1849	6066	247.0	2.21
1836	6024	221.0	2.20	1849	6067	248.0	2.21
1837	6025	222.0	2.20	1850	6069	249.0	2.21
1837	6027	223.0	2.20	1850	6070	250.0	2.21
1838	6029	224.0	2.20	1853	6078	255.0	2.21
1838	6030	225.0	2.20	1855	6085	260.0	2.21
1839	6032	226.0	2.20	1857	6092	265.0	2.22
1839	6034	227.0	2.20	1859	6100	270.0	2.22
1840	6035	228.0	2.20	1861	6107	275.0	2.22
1840	6037	229.0	2.20	1863	6114	280.0	2.22

MEAN GRAIN SIZE, WET DENSITY AND EQUIVALENT SOUND VELOCITIES

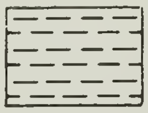
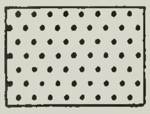
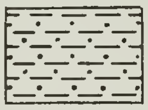
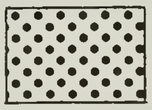
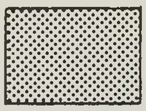
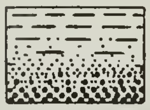
Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc	Velocity m/sec	Velocity ft/sec	Mean Size μ	Wet Density g/cc
1866	6121	285.0	2.22	1913	6275	420.0	2.26
1868	6127	290.0	2.23	1914	6280	425.0	2.26
1870	6134	295.0	2.23	1916	6285	430.0	2.27
1872	6141	300.0	2.23	1917	6290	435.0	2.27
1874	6147	305.0	2.23	1919	6295	440.0	2.27
1876	6153	310.0	2.23	1920	6299	445.0	2.27
1877	6160	315.0	2.23	1921	6304	450.0	2.27
1879	6166	320.0	2.24	1923	6309	455.0	2.27
1881	6172	325.0	2.24	1924	6313	460.0	2.27
1883	6178	330.0	2.24	1926	6318	465.0	2.27
1885	6184	335.0	2.24	1927	6322	470.0	2.27
1887	6190	340.0	2.24	1928	6326	475.0	2.27
1888	6196	345.0	2.24	1930	6331	480.0	2.27
1890	6202	350.0	2.24	1931	6335	485.0	2.28
1892	6207	355.0	2.25	1932	6339	490.0	2.28
1894	6213	360.0	2.25	1934	6344	495.0	2.28
1895	6218	365.0	2.25	1935	6348	500.0	2.28
1897	6224	370.0	2.25				
1899	6229	375.0	2.25				
1900	6235	380.0	2.25				
1902	6240	385.0	2.25				
1904	6245	390.0	2.26				
1905	6250	395.0	2.26				
1907	6255	400.0	2.26				
1908	6261	405.0	2.26				
1910	6266	410.0	2.26				
1911	6271	415.0	2.26				

APPENDIX D

CORE DATA MATCHED TO ACOUSTIC STATIONS OF ALPINE GEOPHYSICAL ASSOCIATES, AREA 1 - ATLANTIC, MARINE GEOPHYSICAL SURVEY PROJECT U.S. NAVAL OCEANOGRAPHIC OFFICE

LEGEND TO ACCOMPANY APPENDIX D

Lithology

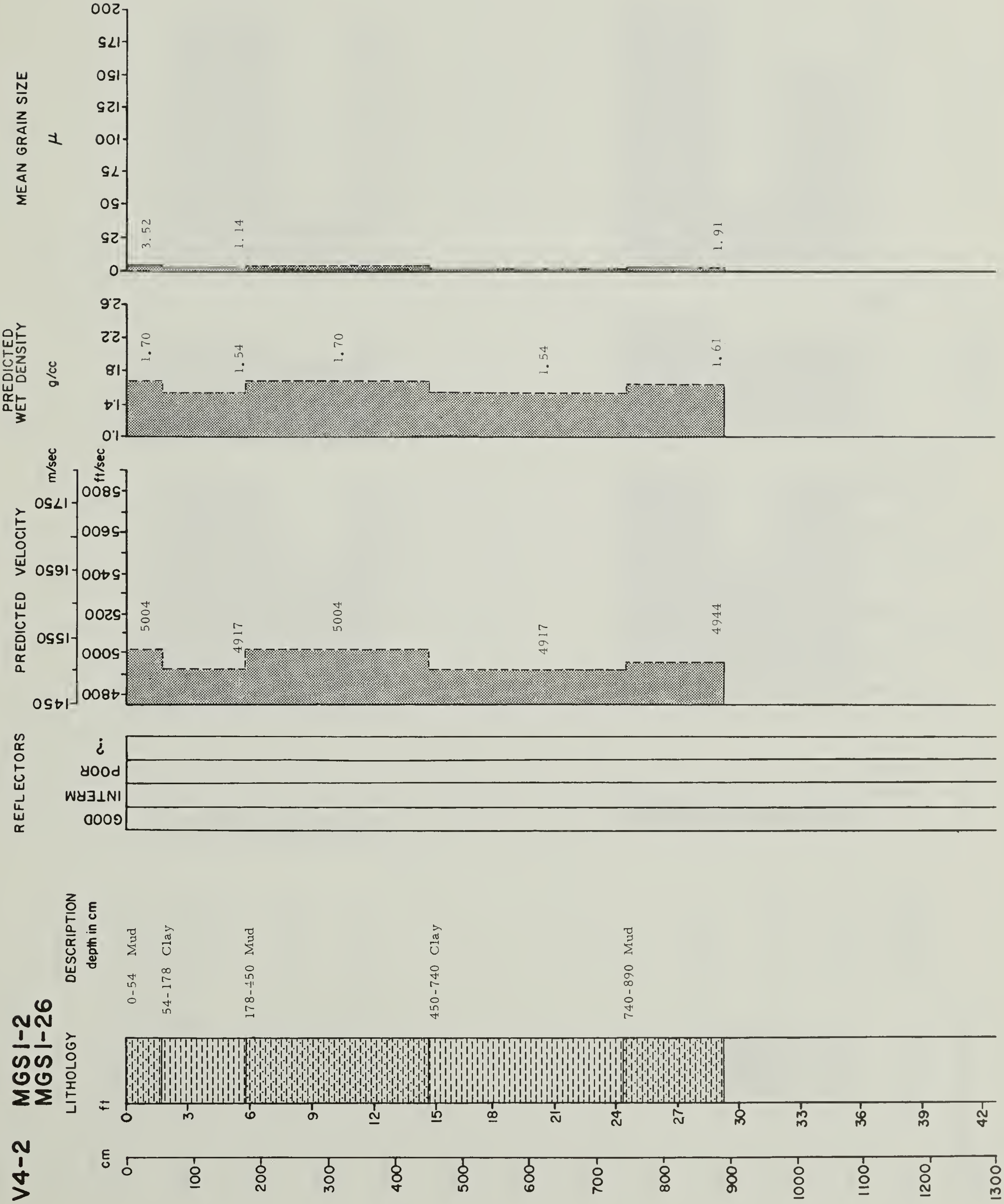
	Clay		Sand
	Mud		Gravel
	Silt		Graded Unit

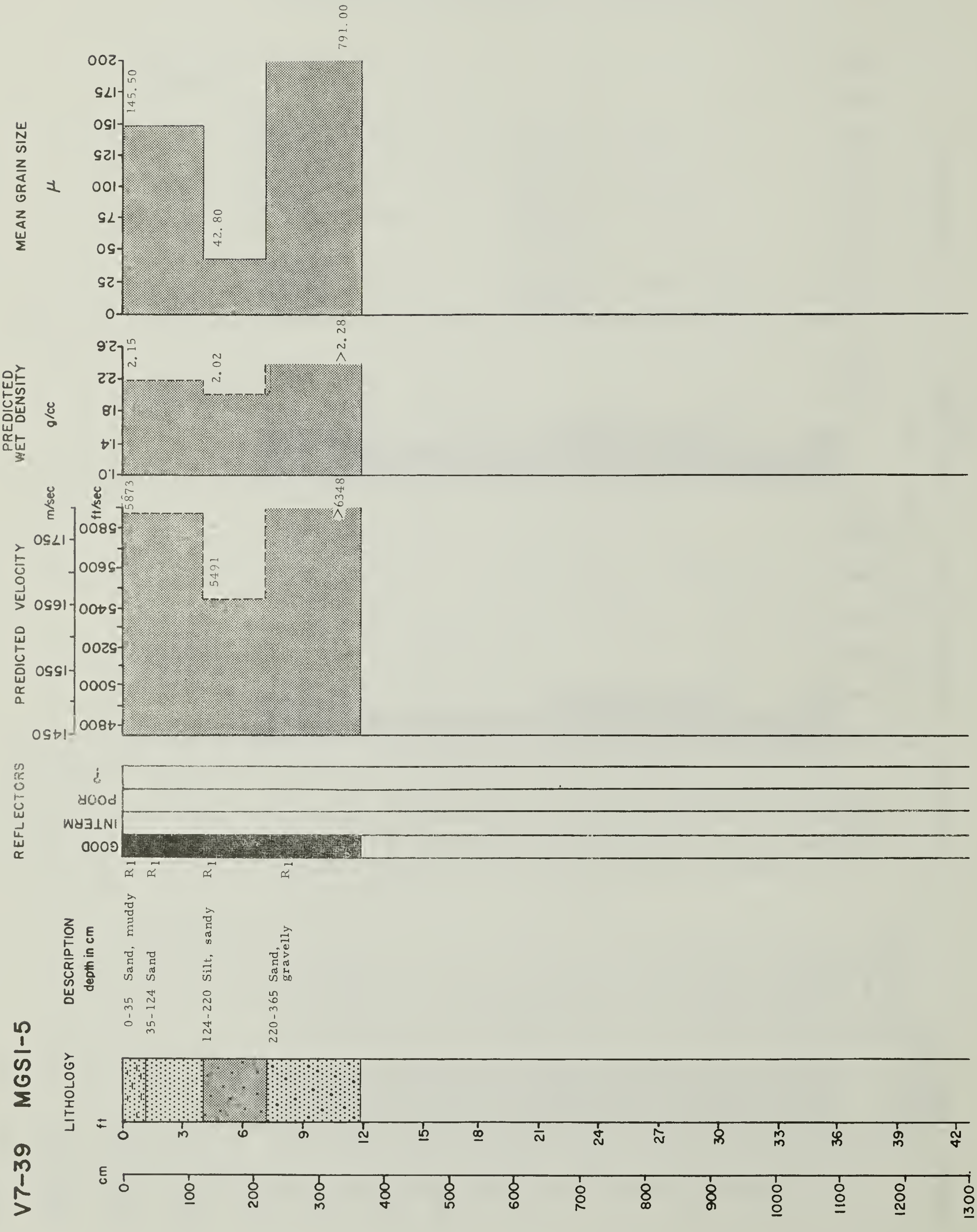
Reflectors: Solid black bars in columns give position and thickness of potential reflecting horizons. Reflectors are layers whose physical properties present high contrasts in acoustic impedance relative to the overlying seawater or sediments with which they are interstratified. The breakdown is qualitative: 1) good reflector -- >10 cm thick, 2) intermediate reflector -- 5 to 10 cm thick, 3) poor reflector -- <5 cm thick with well-defined upper and lower limits, and 4) questionable reflector -- <5 cm thick with poorly-defined limits.

Predicted velocity: Dashed line outlining the velocity profile of core represents predictions taken from table given in Appendix C. Velocities are adjusted to 23°C at 1 atmosphere pressure. They must be corrected to *in situ* conditions prior to use in the field. Prediction of sound velocity is based on mean grain size of sediment.

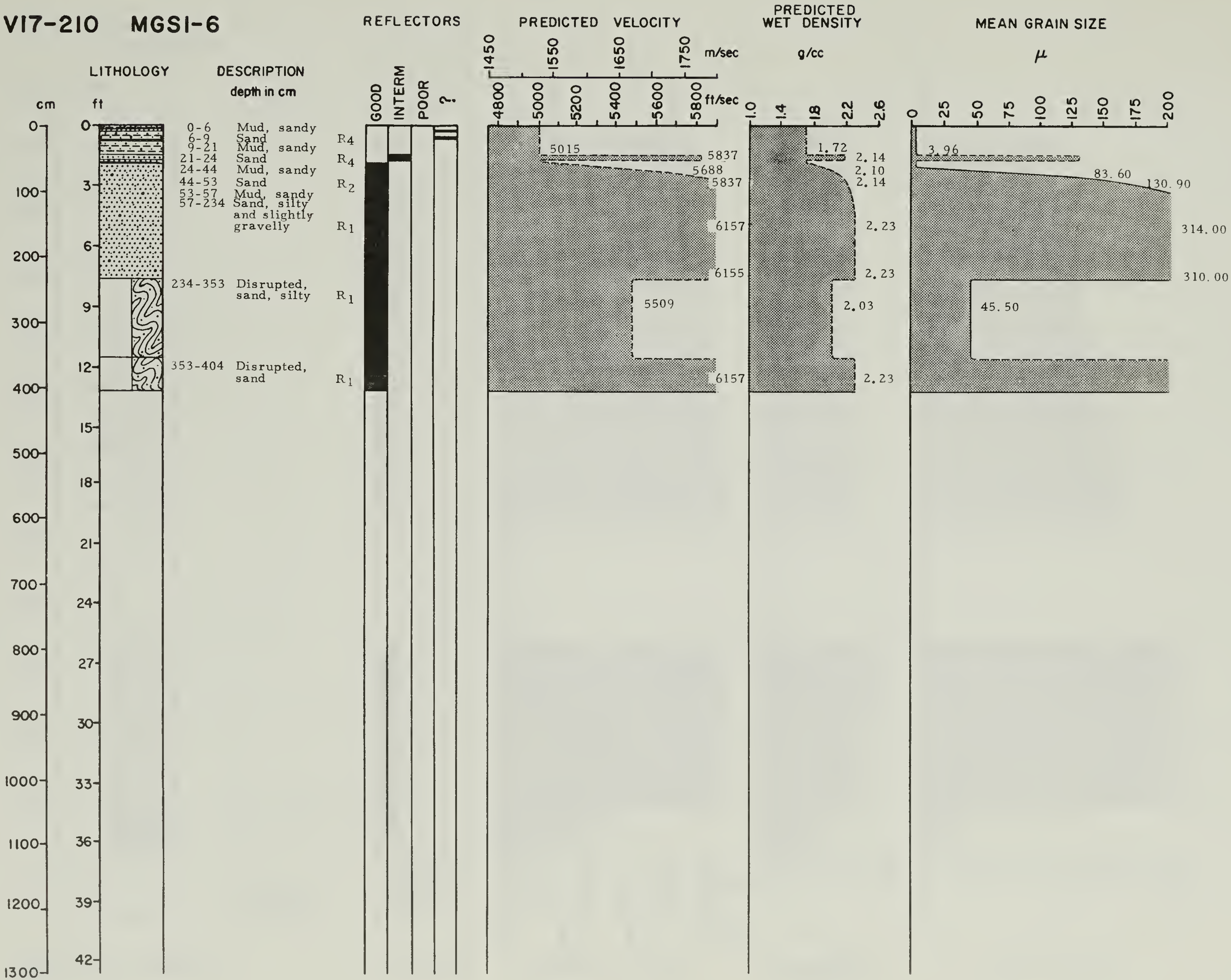
Wet density: The profile of wet density is a prediction using mean grain size as an index to physical properties of the cores. These predictions are arrived at indirectly and should be used with this understanding.

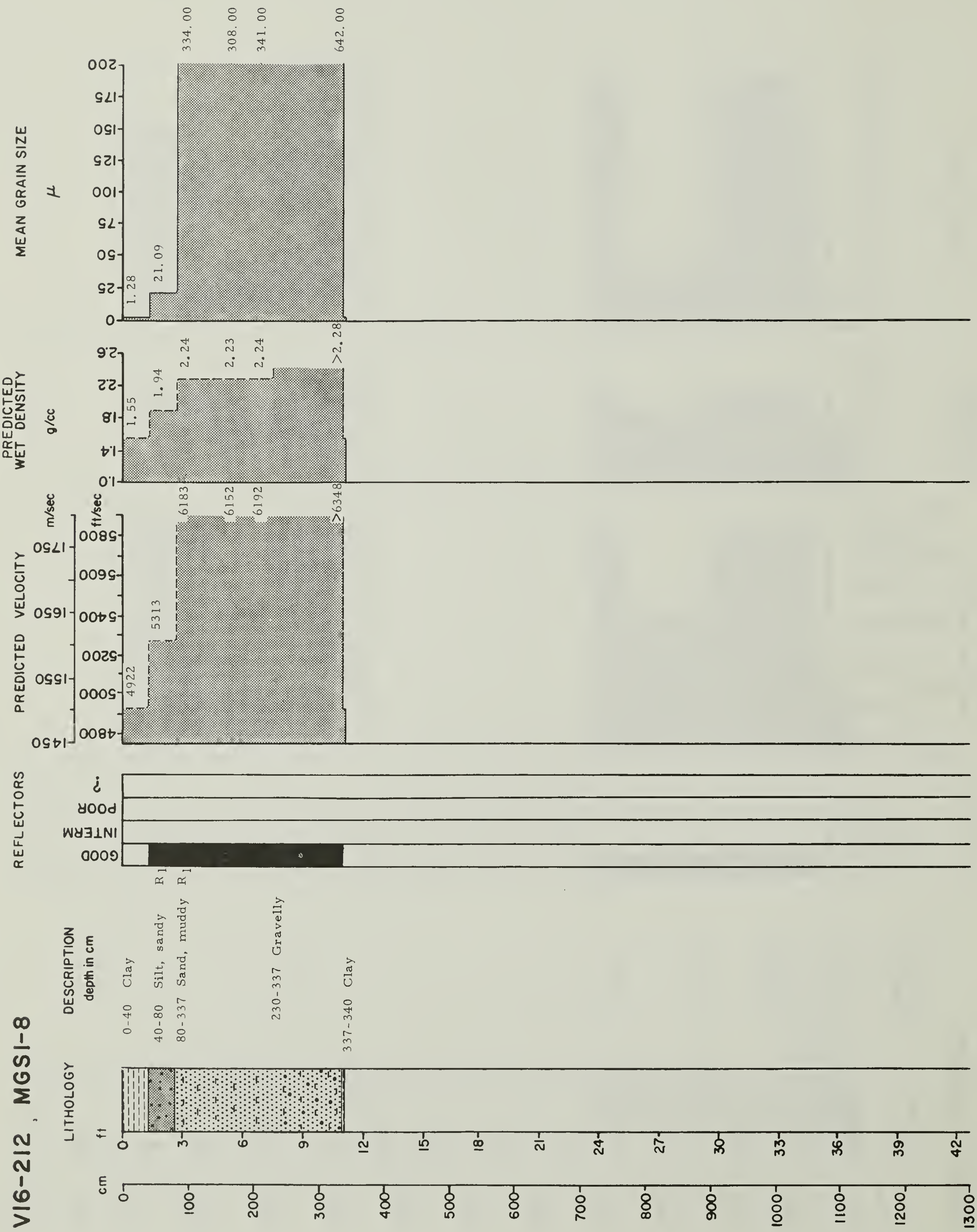
Mean grain size: Solid line on textural profile of core indicates actual laboratory measurement. Dashed line includes sections of core where direct measurement was not made, but data were determined from representative samples of similar layers comprising core.

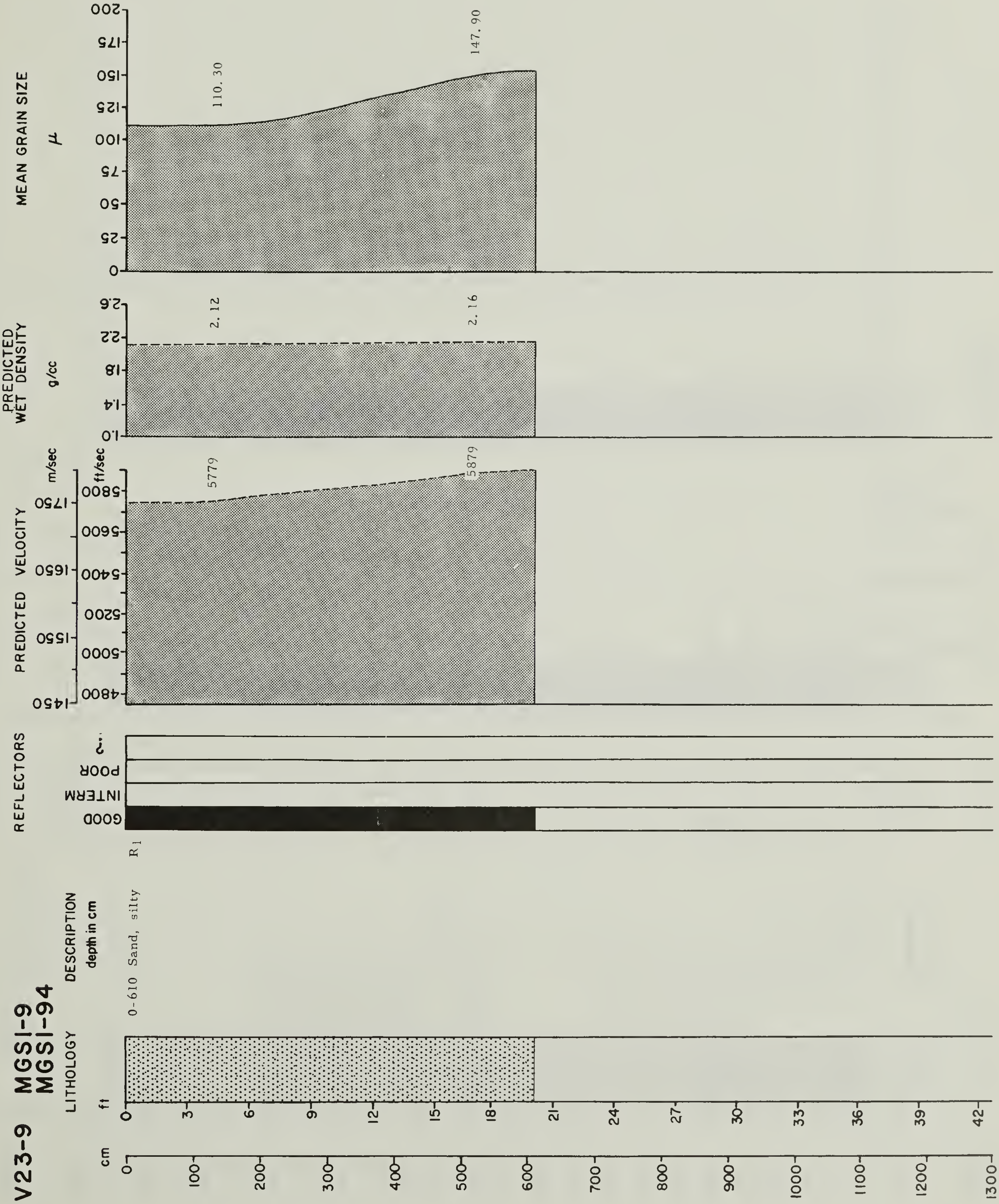

V4-2
MGSI-2
MGSI-26
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-54 Mud
54-178 Clay
178-450 Mud
450-740 Clay
740-890 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
5004
4917
5004
4917
4944
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.70
1.54
1.70
1.54
1.61
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
3.52
1.14
1.91
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

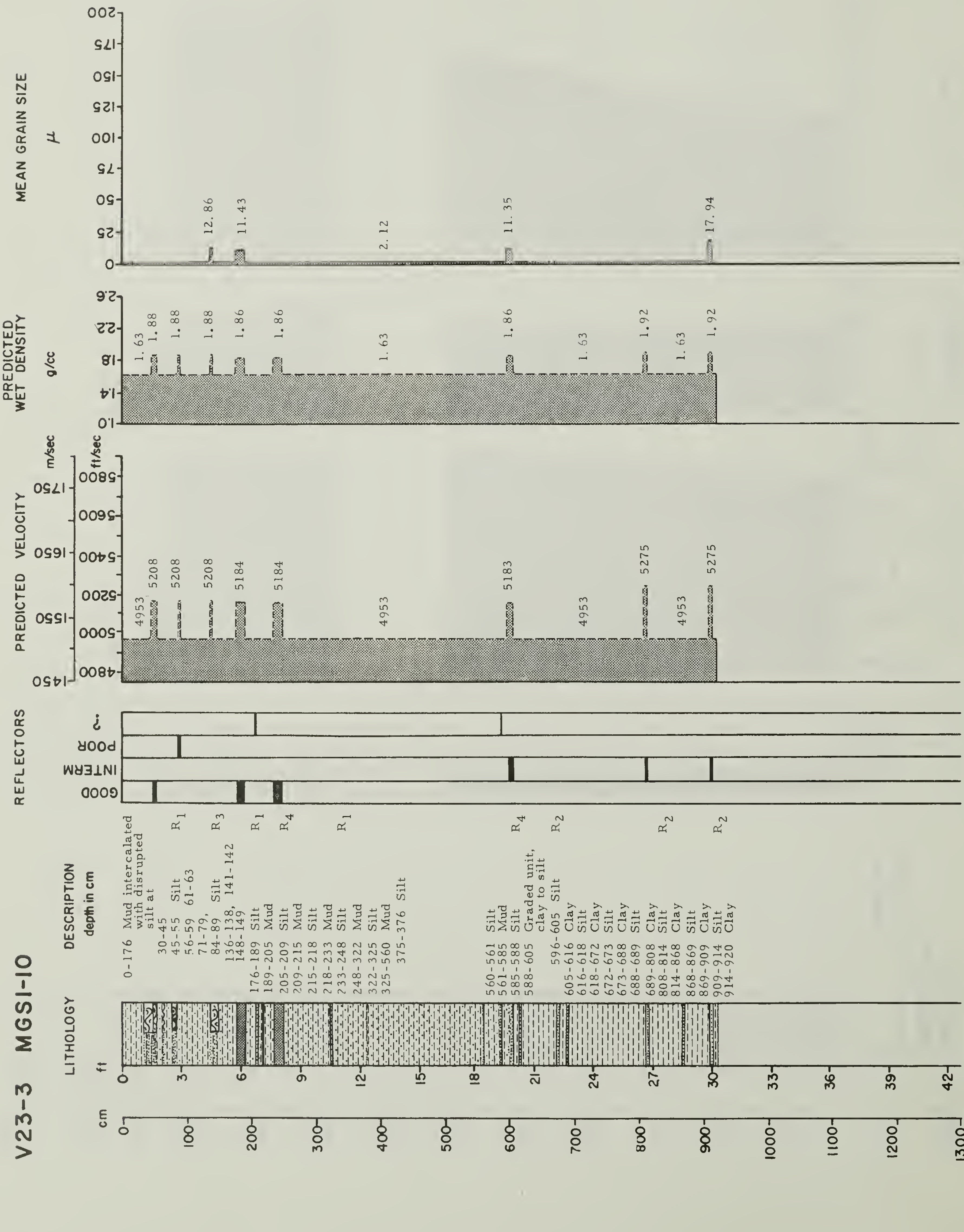

V7-39 MGSI-5
LITHOLOGY
DESCRIPTION
depth in cm
0-35 Sand, muddy
35-124 Sand
124-220 Silt, sandy
220-365 Sand, gravelly
REFLECTORS
GOOD
INTERM
POOR
?
R1
PREDICTED VELOCITY
m/sec
ft/sec
5873
5491
>6348
PREDICTED WET DENSITY
g/cc
2.15
2.02
>2.28
MEAN GRAIN SIZE
μ
145.50
42.80
791.00
cm
ft

V17-210 MGSI-6

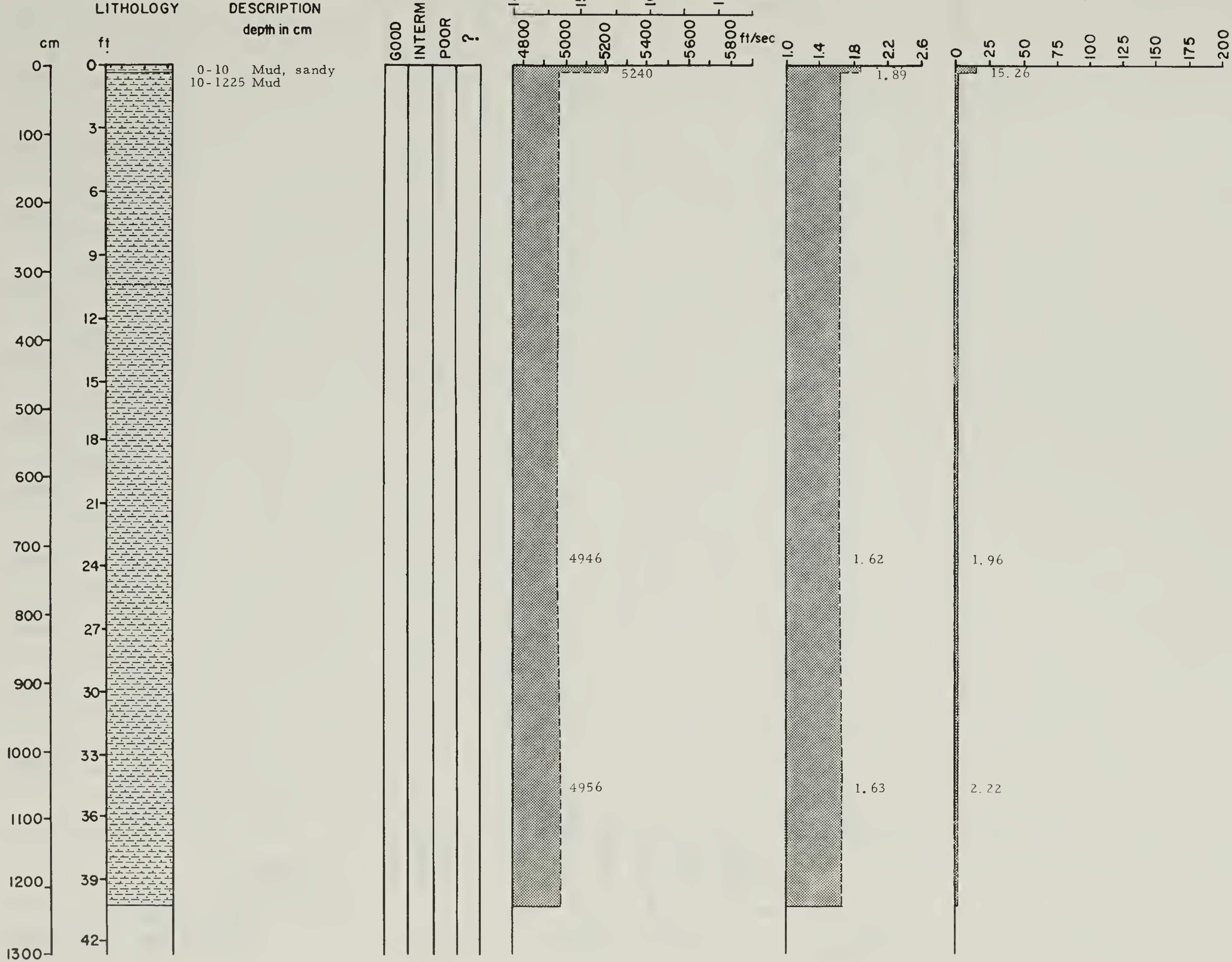


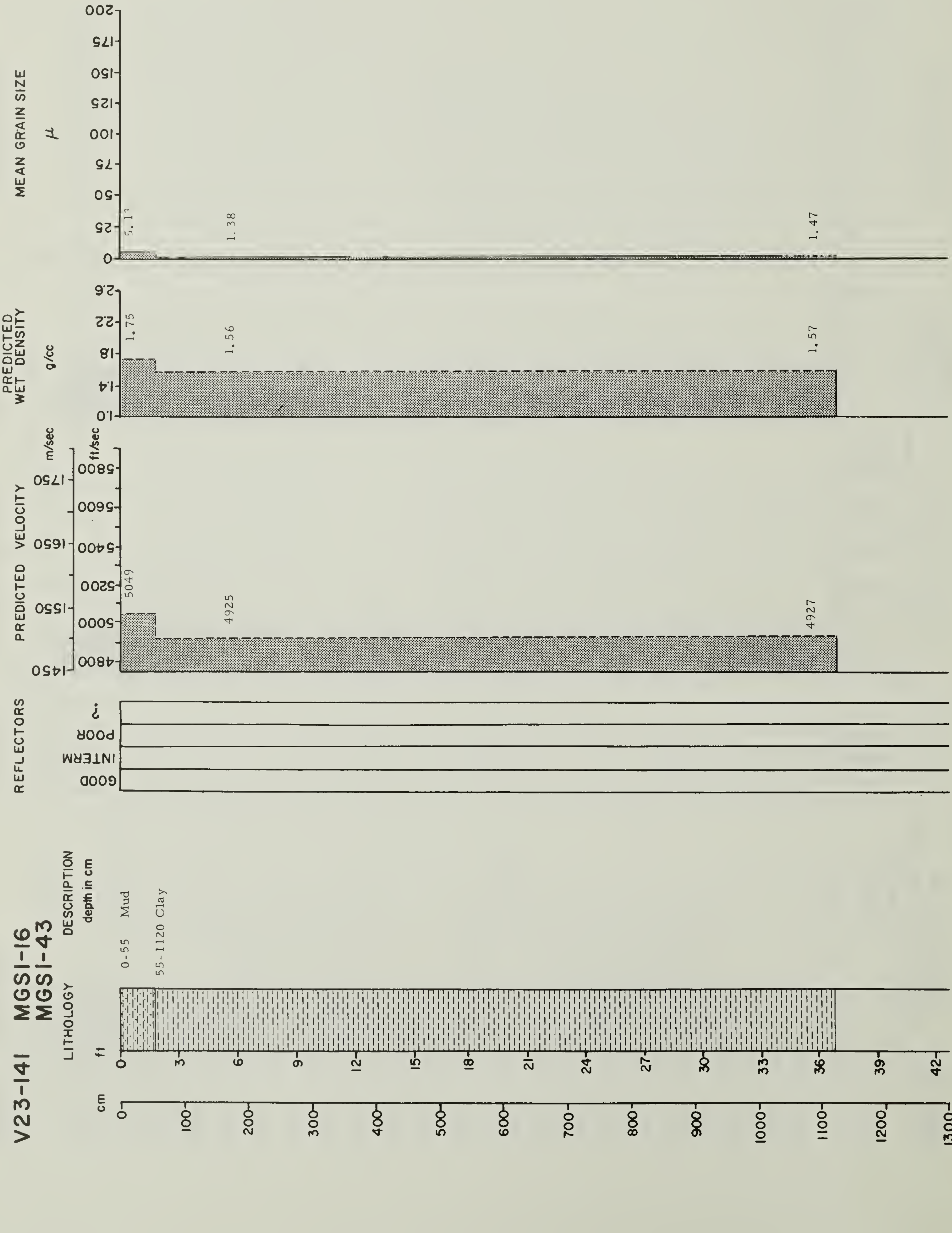

V16-212, MGSI-8
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-40 Clay
40-80 Silt, sandy
80-337 Sand, muddy
230-337 Gravelly
337-340 Clay
REFLECTORS
GOOD
INTERM
POOR
?
R1
R1
PREDICTED VELOCITY
m/sec
ft/sec
4922
5313
6183
6152
6192
>6348
PREDICTED WET DENSITY
g/cc
1.55
1.94
2.24
2.23
2.24
>2.28
MEAN GRAIN SIZE
μ
1.28
21.09
334.00
308.00
341.00
642.00

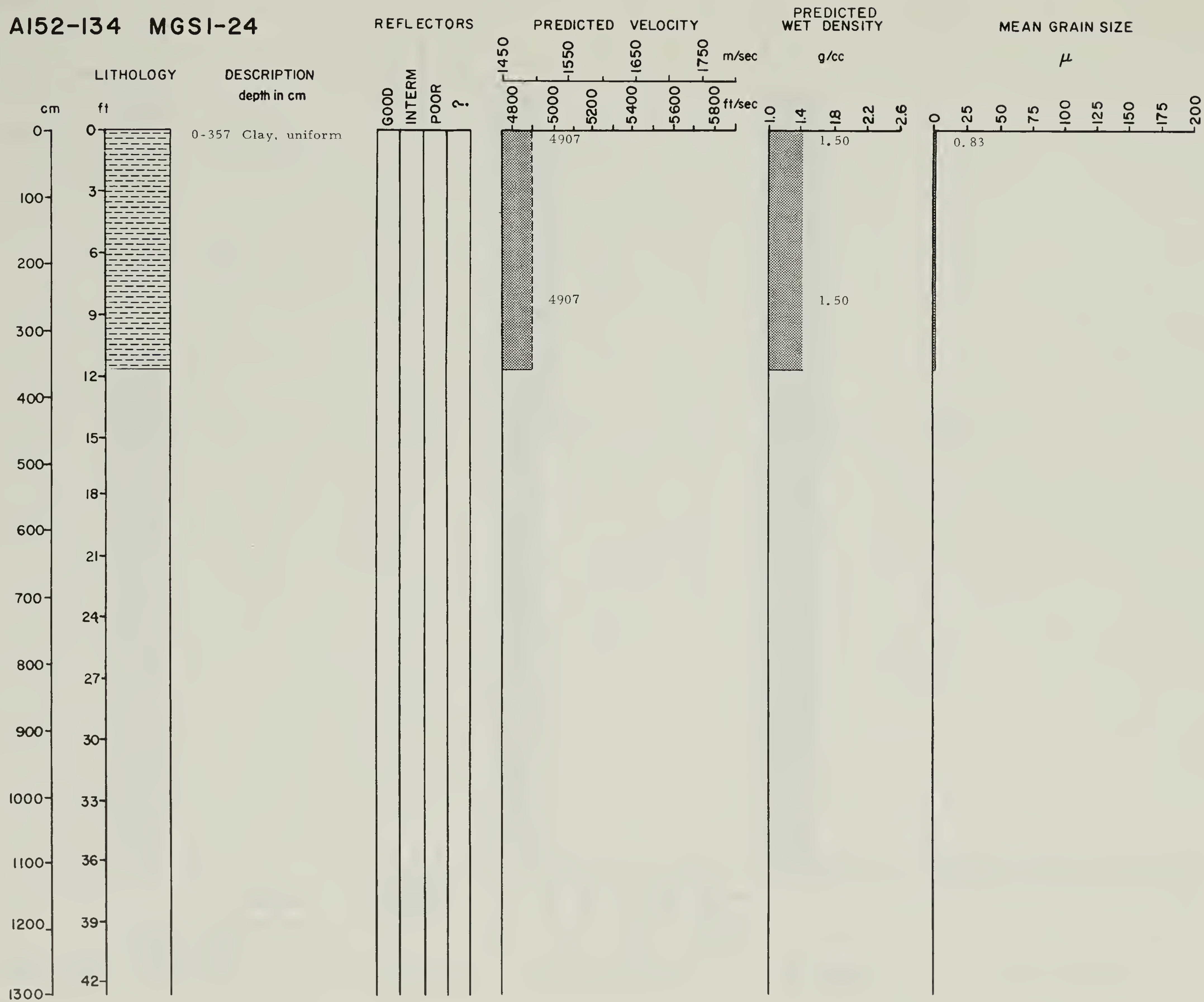

V23-9 MGSI-9 MGSI-94
cm
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
ft
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42
LITHOLOGY
DESCRIPTION depth in cm
0-610 Sand, silty
REFLECTORS
GOOD INTERM POOR ?
R1
PREDICTED VELOCITY
m/sec
1450 1550 1650 1750
ft/sec
4800 5000 5200 5400 5600 5800
5779
5879
PREDICTED WET DENSITY
g/cc
1.0 1.4 1.8 2.2 2.6
2.12
2.16
MEAN GRAIN SIZE
μ
0 25 50 75 100 125 150 175 200
110.30
147.90

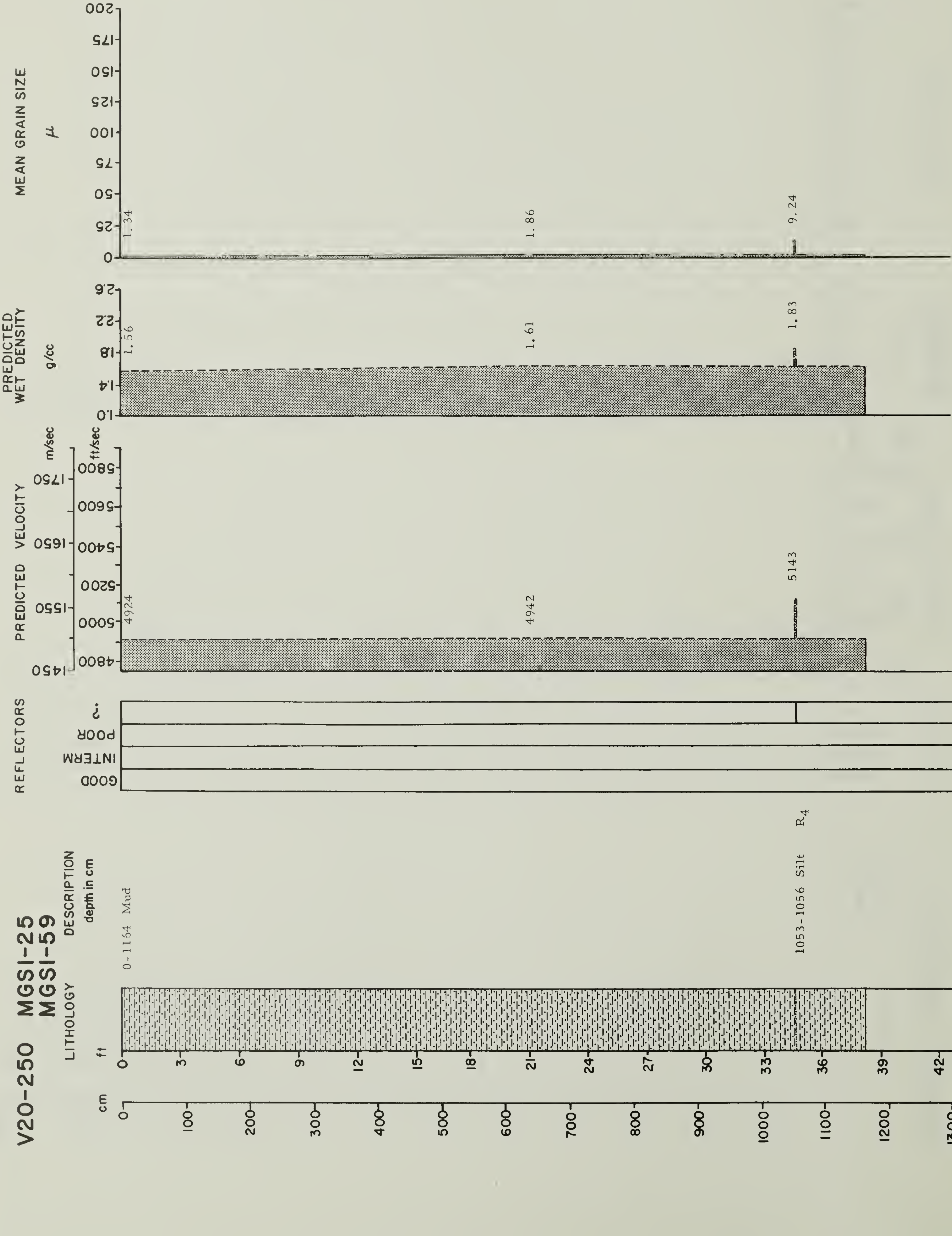

V23-3 MGSI-10
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-176 Mud intercalated with disrupted silt at
30-45
45-55 Silt
56-59 61-63
71-79,
84-89 Silt
136-138, 141-142
148-149
176-189 Silt
189-205 Mud
205-209 Silt
209-215 Mud
215-218 Silt
218-233 Mud
233-248 Silt
248-322 Mud
322-325 Silt
325-560 Mud
375-376 Silt
560-561 Silt
561-585 Mud
585-588 Silt
588-605 Graded unit, clay to silt
596-605 Silt
605-616 Clay
616-618 Silt
618-672 Clay
672-673 Silt
673-688 Clay
688-689 Silt
689-808 Clay
808-814 Silt
814-868 Clay
868-869 Silt
869-909 Clay
909-914 Silt
914-920 Clay
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
PREDICTED WET DENSITY
g/cc
MEAN GRAIN SIZE
μ

V22-234 MGSI-13, 14 MGSI-15, 28, 29

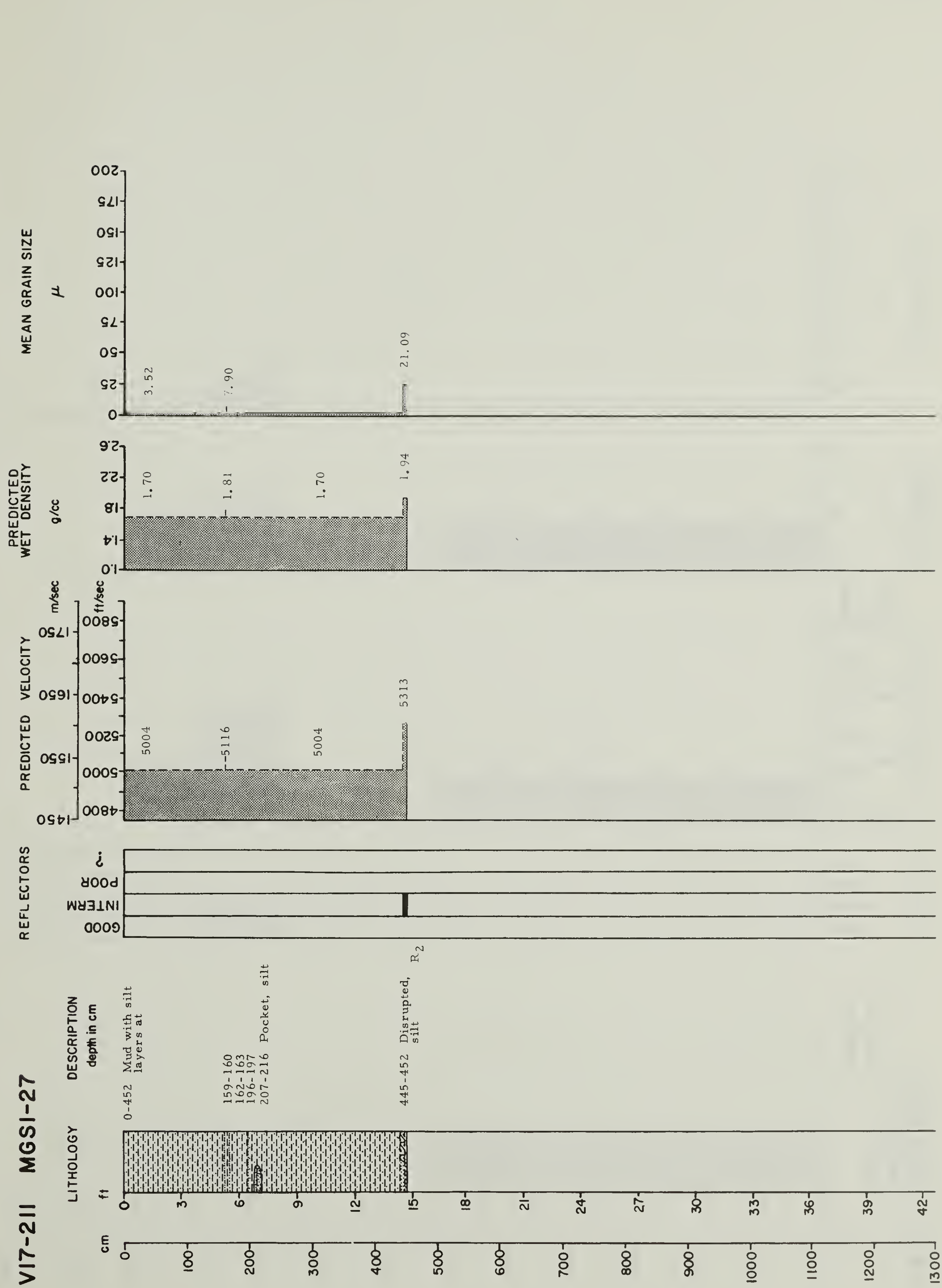


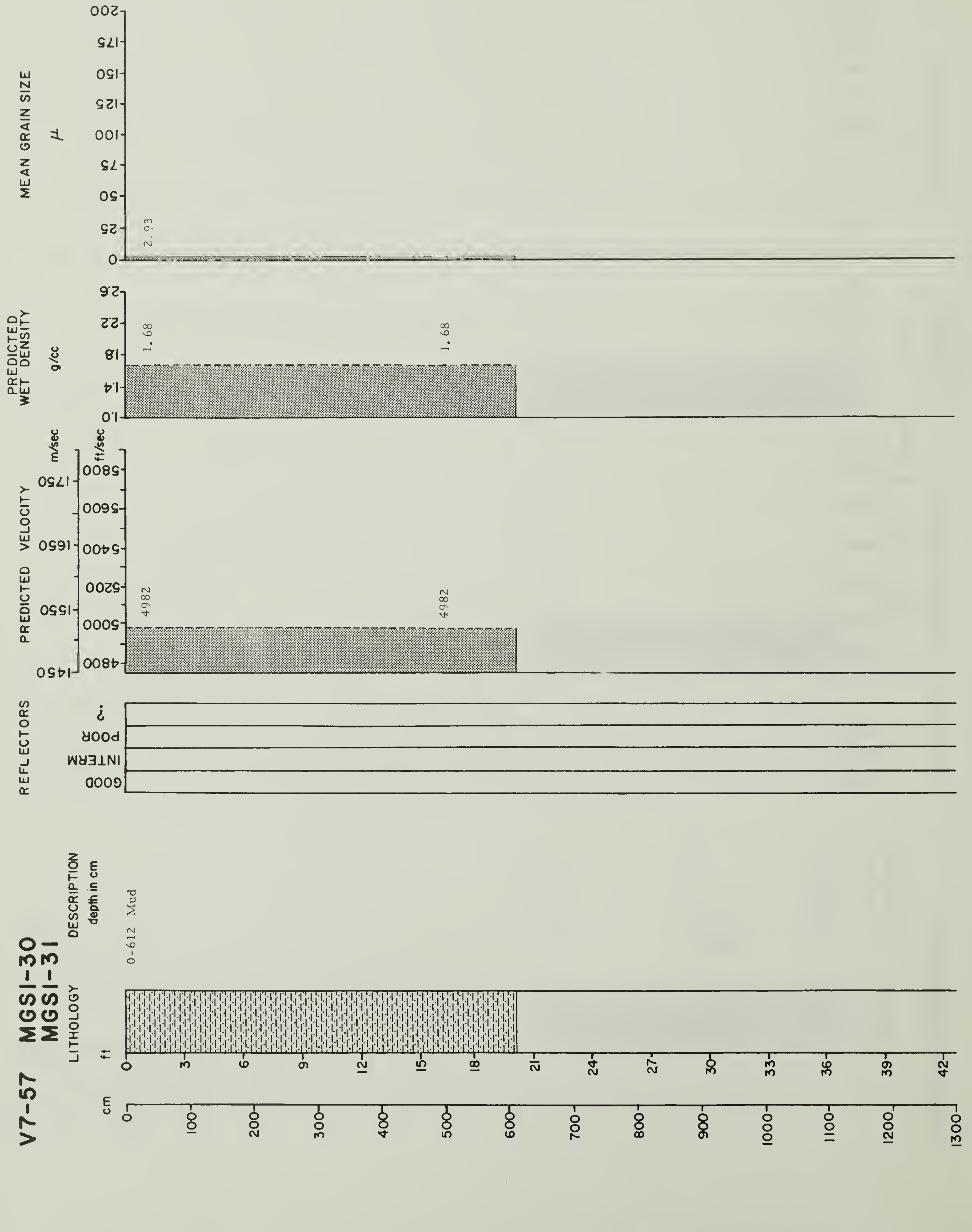

V23-141
MGSI-16
MGSI-43
LITHOLOGY
DESCRIPTION
depth in cm
0-55 Mud
55-1120 Clay
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5049
4925
4927
PREDICTED WET DENSITY
g/cc
1.75
1.56
1.57
MEAN GRAIN SIZE
μ
1.38
1.47
cm
ft

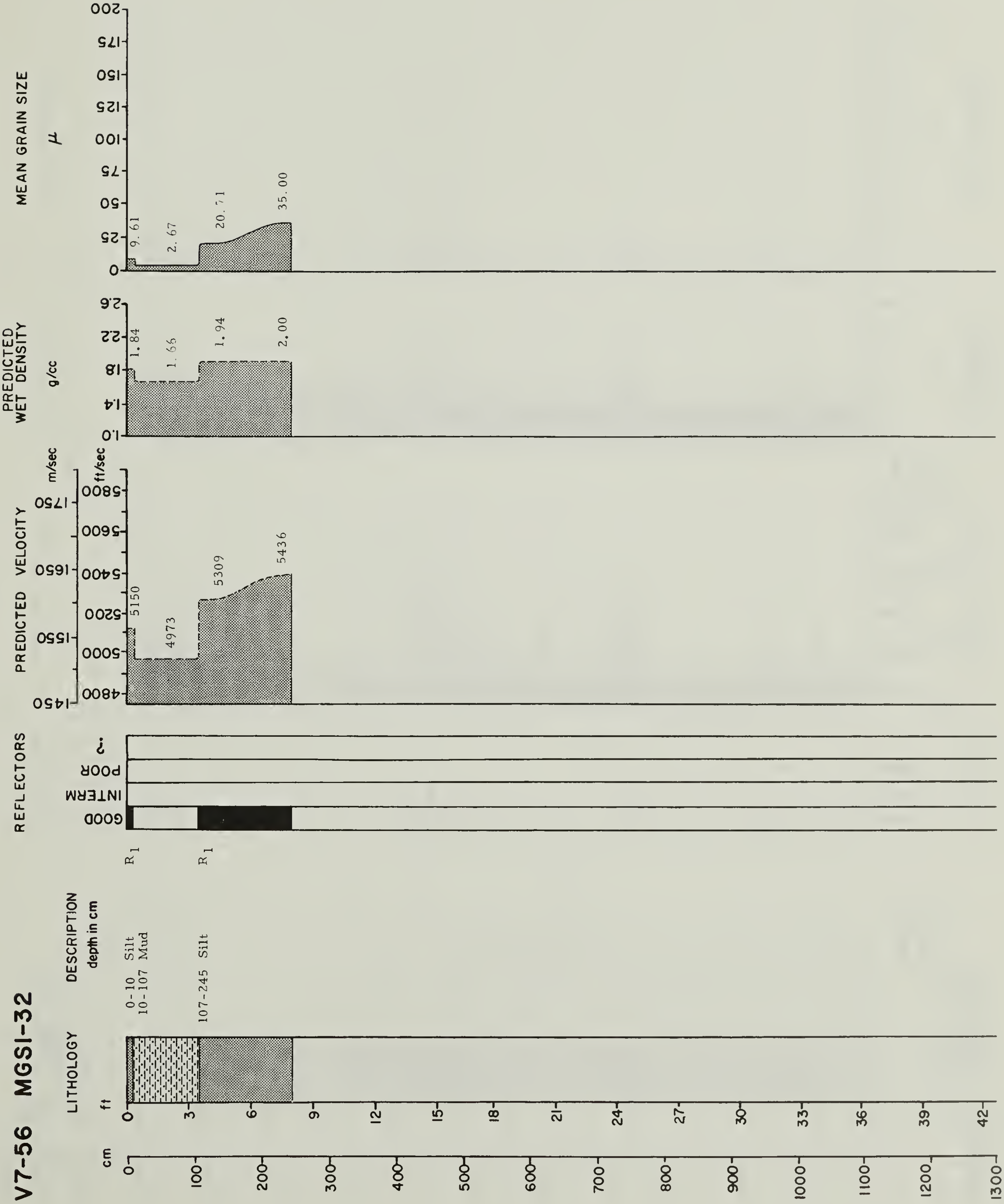

A152-134 MGS1-24
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-357 Clay, uniform
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4907
4907
PREDICTED
WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.50
1.50
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
0.83
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

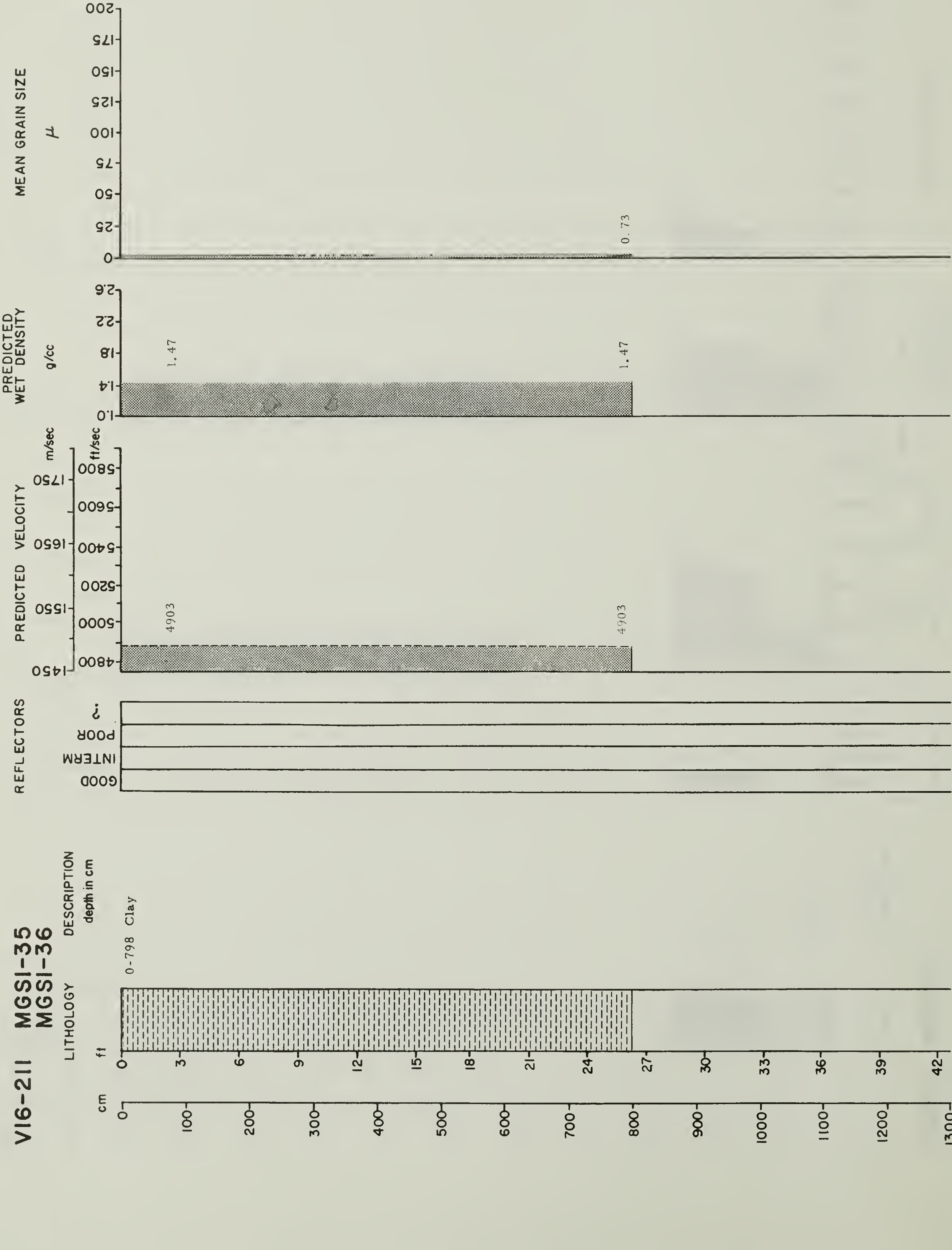


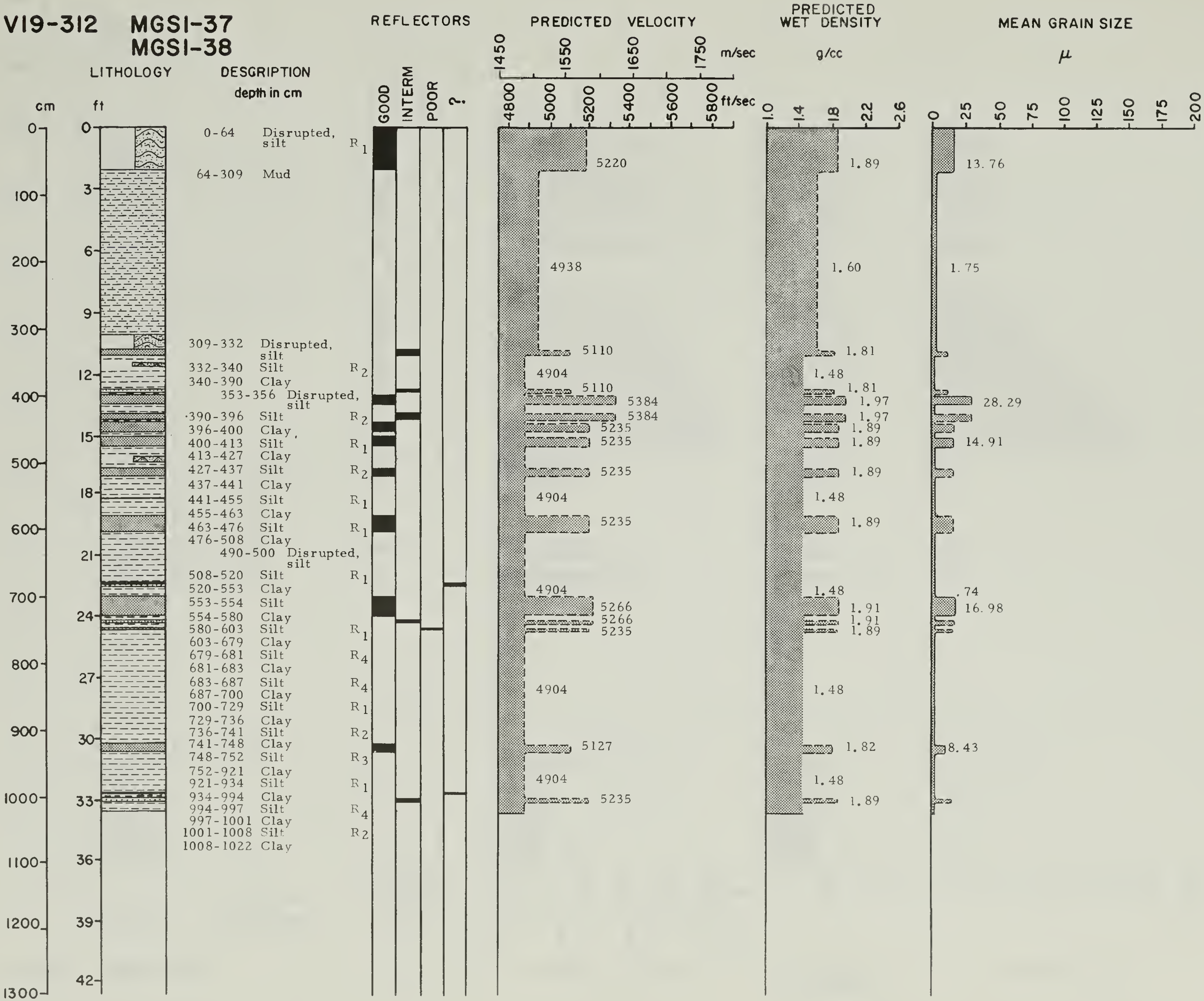
V20-250 MGSI-25
MGSI-59
LITHOLOGY
DESCRIPTION
depth in cm
0-1164 Mud
1053-1056 Silt
R_4
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4924
4942
5143
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.56
1.61
1.83
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
1.34
1.86
9.24
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

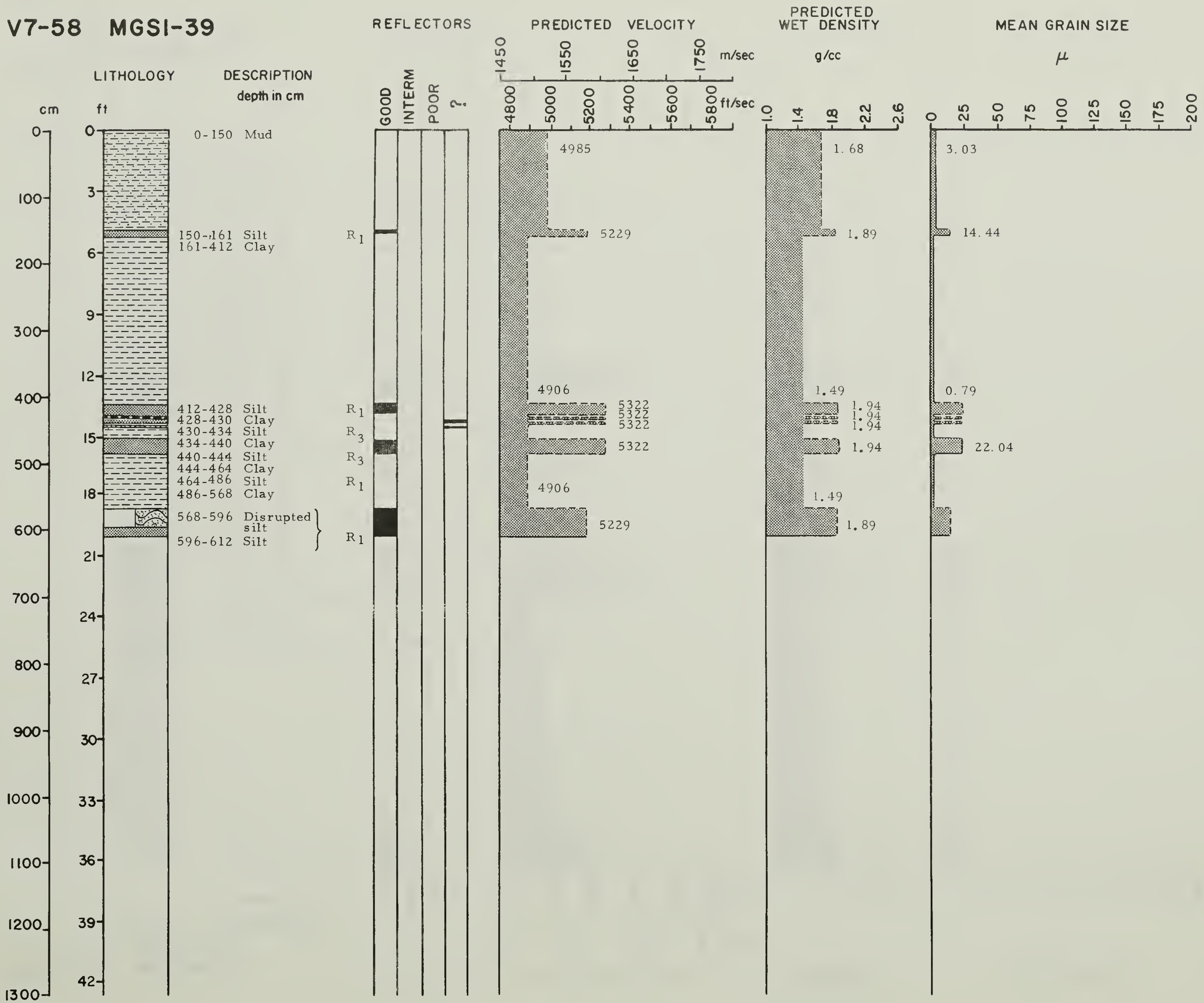

V17-211 MGSI-27
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
LITHOLOGY
DESCRIPTION
depth in cm
0-452 Mud with silt layers at
159-160
162-163
196-197
207-216 Pocket, silt
445-452 Disrupted, silt
REFLECTORS
GOOD
INTERM
POOR
?
R_2
PREDICTED VELOCITY
m/sec
1450
1550
1650
1750
ft/sec
4800
5000
5200
5400
5600
5800
5004
5116
5004
5313
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.70
1.81
1.70
1.94
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
3.52
7.90
21.09

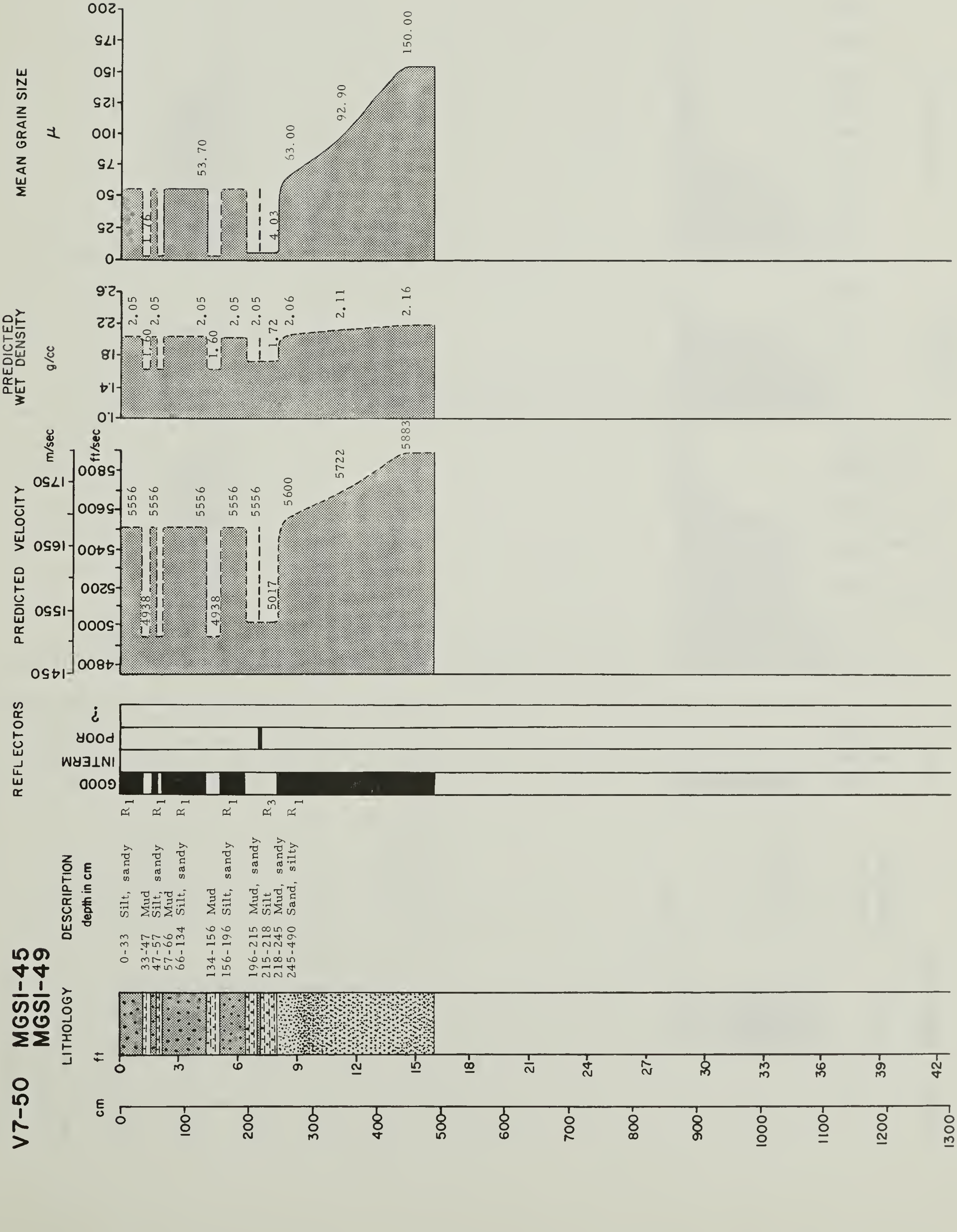

V7-57 MGSI-30
MGSI-31
LITHOLOGY
DESCRIPTION
depth in cm
0-612 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4982
4982
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.68
1.68
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
2.93
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42


V7-56 MGSI-32
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
LITHOLOGY
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
DESCRIPTION depth in cm
0-10 Silt
10-107 Mud
107-245 Silt
REFLECTORS
GOOD
INTERM
POOR
?
R1
R1
PREDICTED VELOCITY
m/sec
1450
1550
1650
1750
ft/sec
4800
5000
5200
5400
5600
5800
5150
4973
5309
5436
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.84
1.66
1.94
2.00
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
9.61
2.67
20.71
35.00

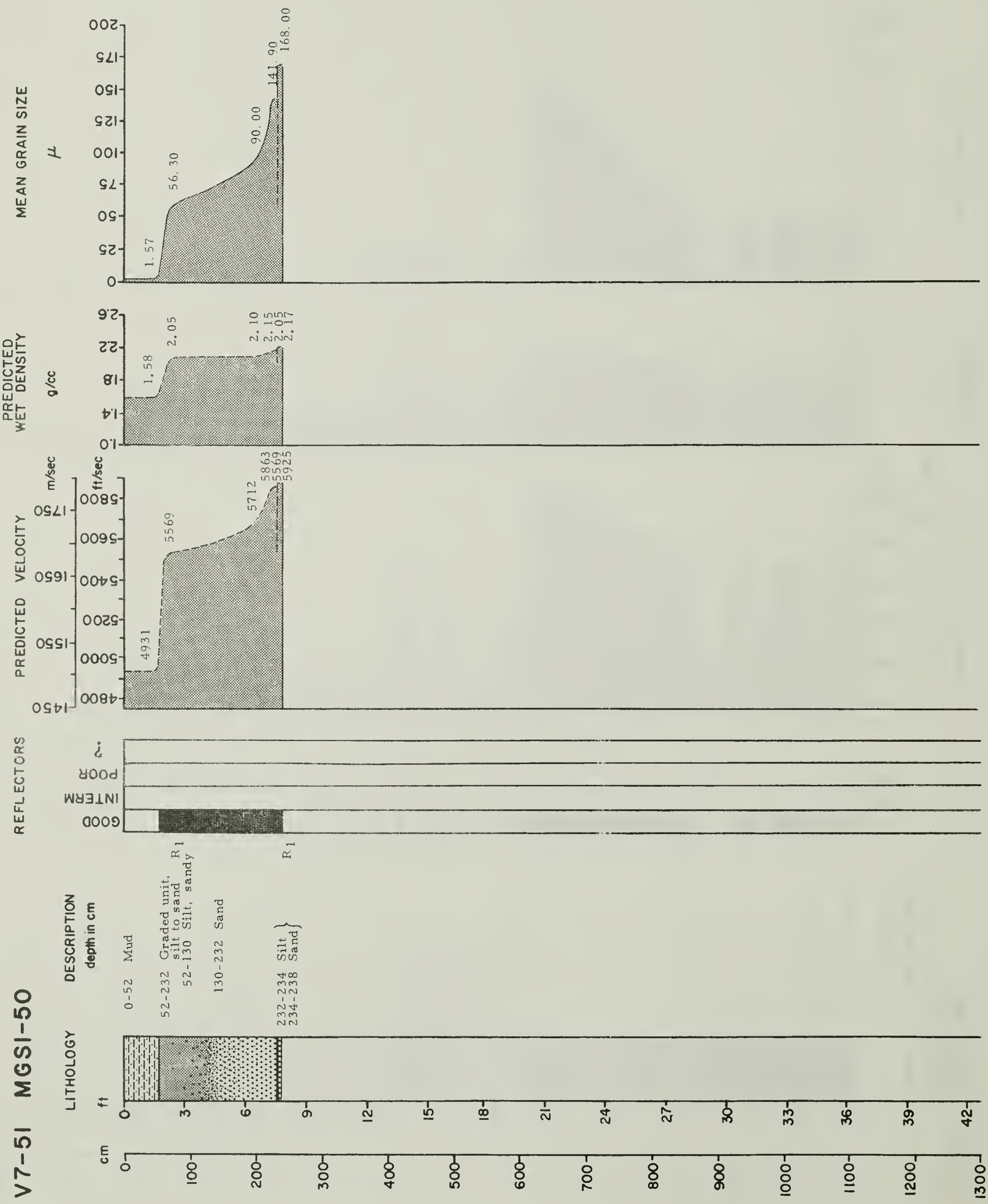

V16-211 MGSI-35 MGSI-36
LITHOLOGY
DESCRIPTION
depth in cm
0-798 Clay
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4903
4903
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.47
1.47
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
0.73
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

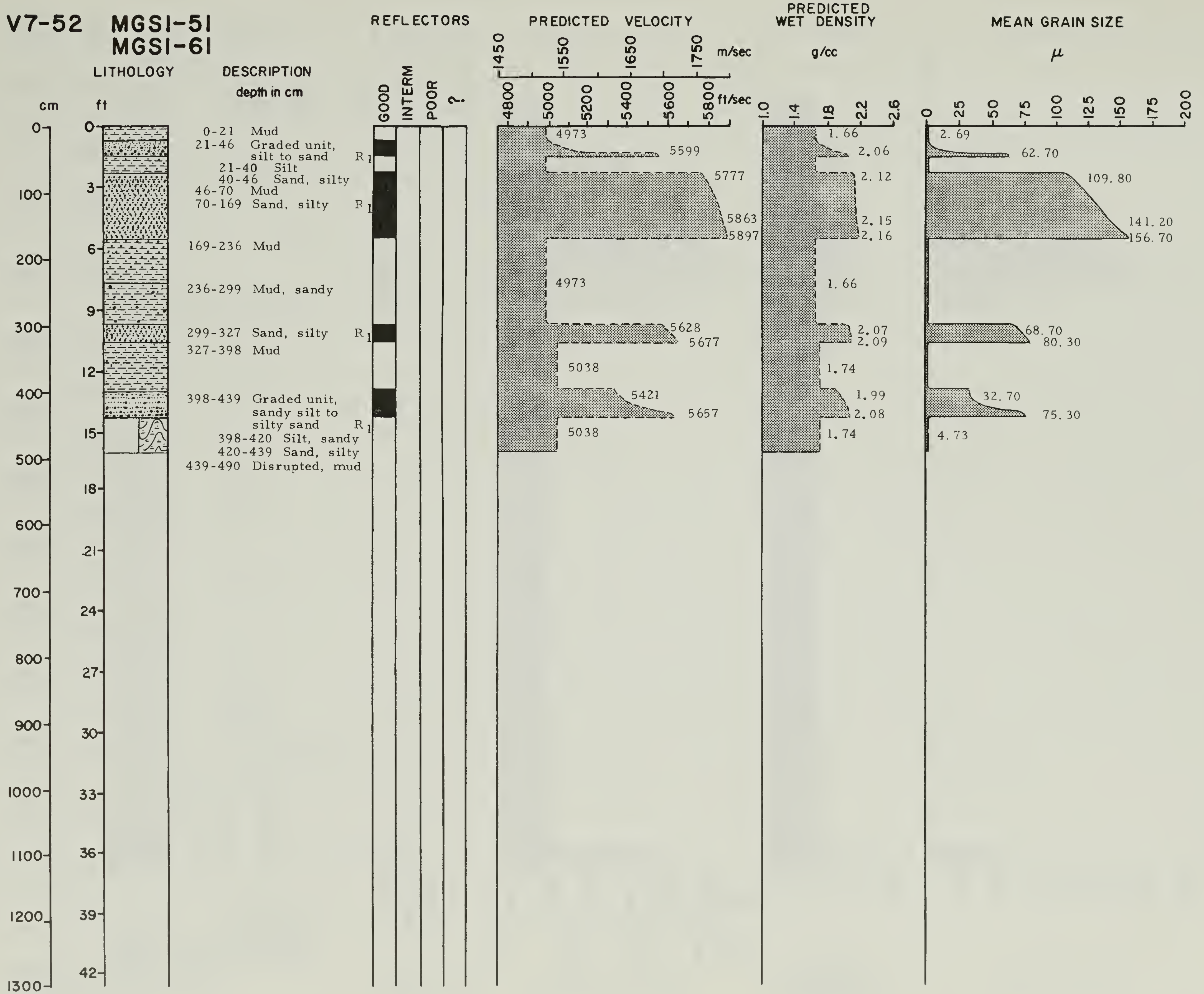

V19-312 MGSI-37
MGSI-38
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-64 Disrupted, silt R1
64-309 Mud
309-332 Disrupted, silt
332-340 Silt R2
340-390 Clay
353-356 Disrupted, silt
390-396 Silt R2
396-400 Clay
400-413 Silt R1
413-427 Clay
427-437 Silt R2
437-441 Clay
441-455 Silt R1
455-463 Clay
463-476 Silt R1
476-508 Clay
490-500 Disrupted, silt
508-520 Silt R1
520-553 Clay
553-554 Silt
554-580 Clay
580-603 Silt R1
603-679 Clay
679-681 Silt R4
681-683 Clay
683-687 Silt R4
687-700 Clay
700-729 Silt R1
729-736 Clay
736-741 Silt R2
741-748 Clay
748-752 Silt R3
752-921 Clay
921-934 Silt R1
934-994 Clay
994-997 Silt R4
997-1001 Clay
1001-1008 Silt R2
1008-1022 Clay
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
PREDICTED WET DENSITY
g/cc
MEAN GRAIN SIZE
μ

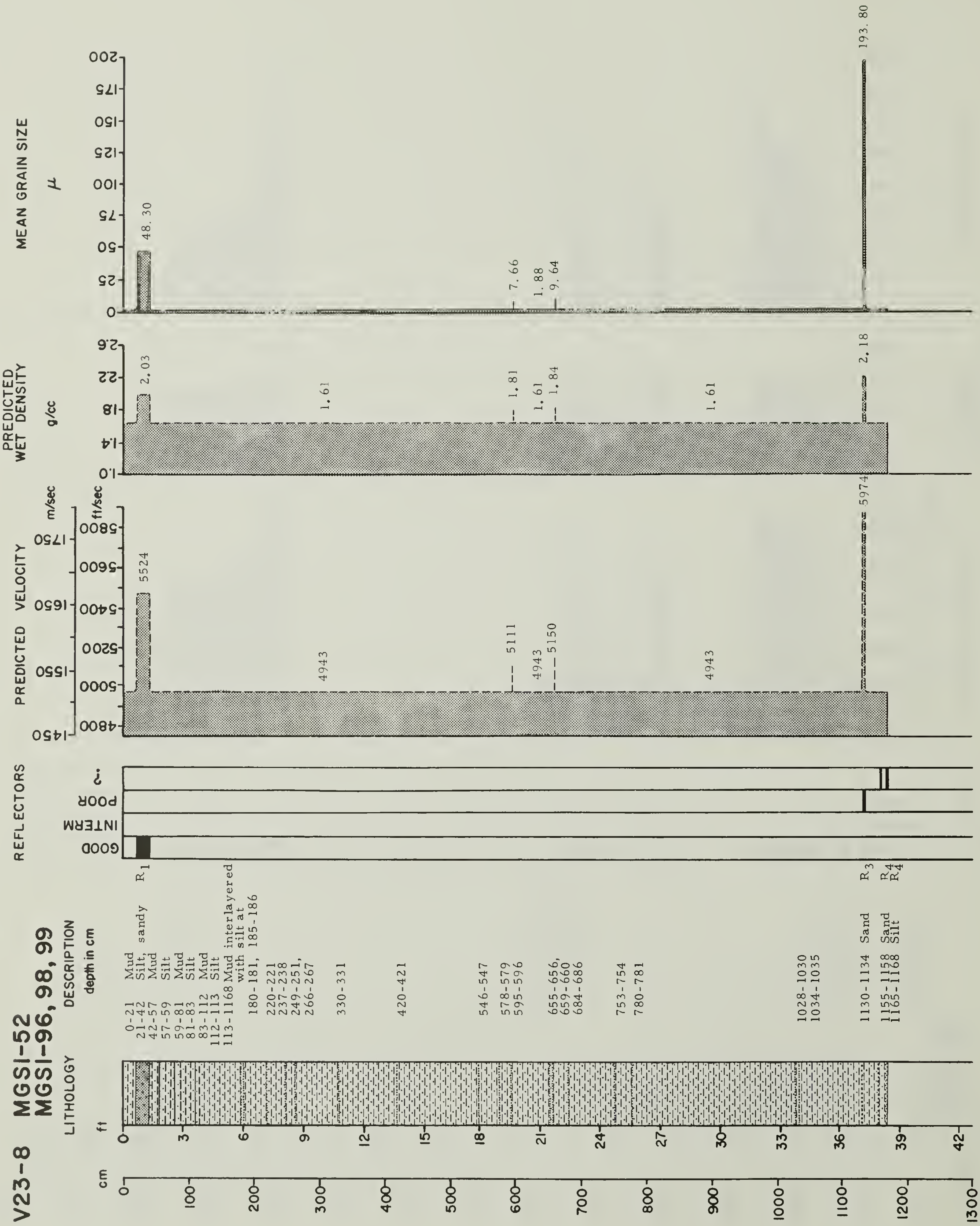

V7-58 MGSI-39
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-150 Mud
150-161 Silt
161-412 Clay
412-428 Silt
428-430 Clay
430-434 Silt
434-440 Clay
440-444 Silt
444-464 Clay
464-486 Silt
486-568 Clay
568-596 Disrupted silt
596-612 Silt
REFLECTORS
GOOD
INTERM
POOR
?
R1
R1
R3
R3
R1
R1
PREDICTED VELOCITY
m/sec
ft/sec
4985
5229
4906
5322
5322
5322
5322
4906
5229
PREDICTED WET DENSITY
g/cc
1.68
1.89
1.49
1.94
1.94
1.94
1.94
1.49
1.89
MEAN GRAIN SIZE
μ
3.03
14.44
0.79
22.04

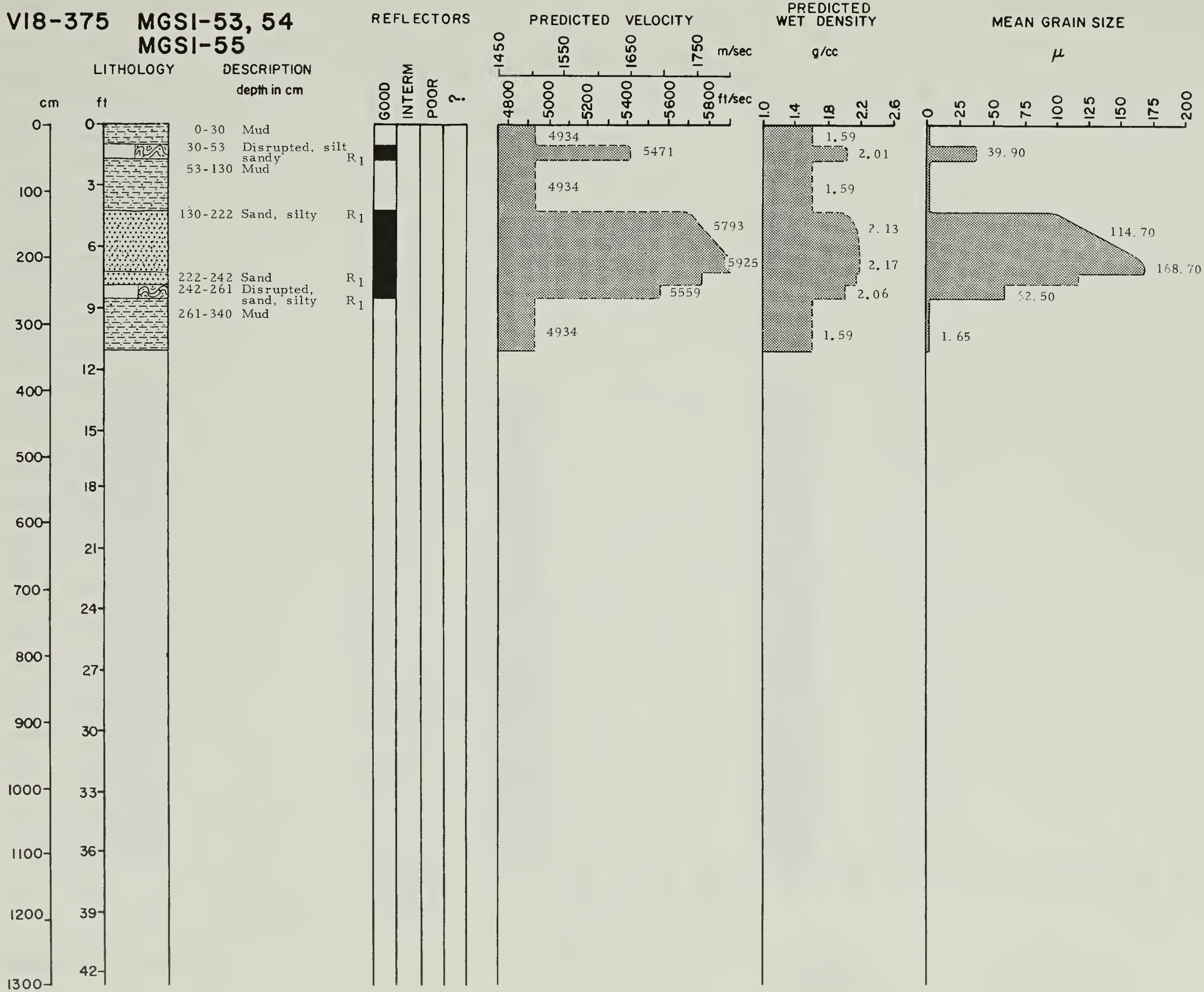


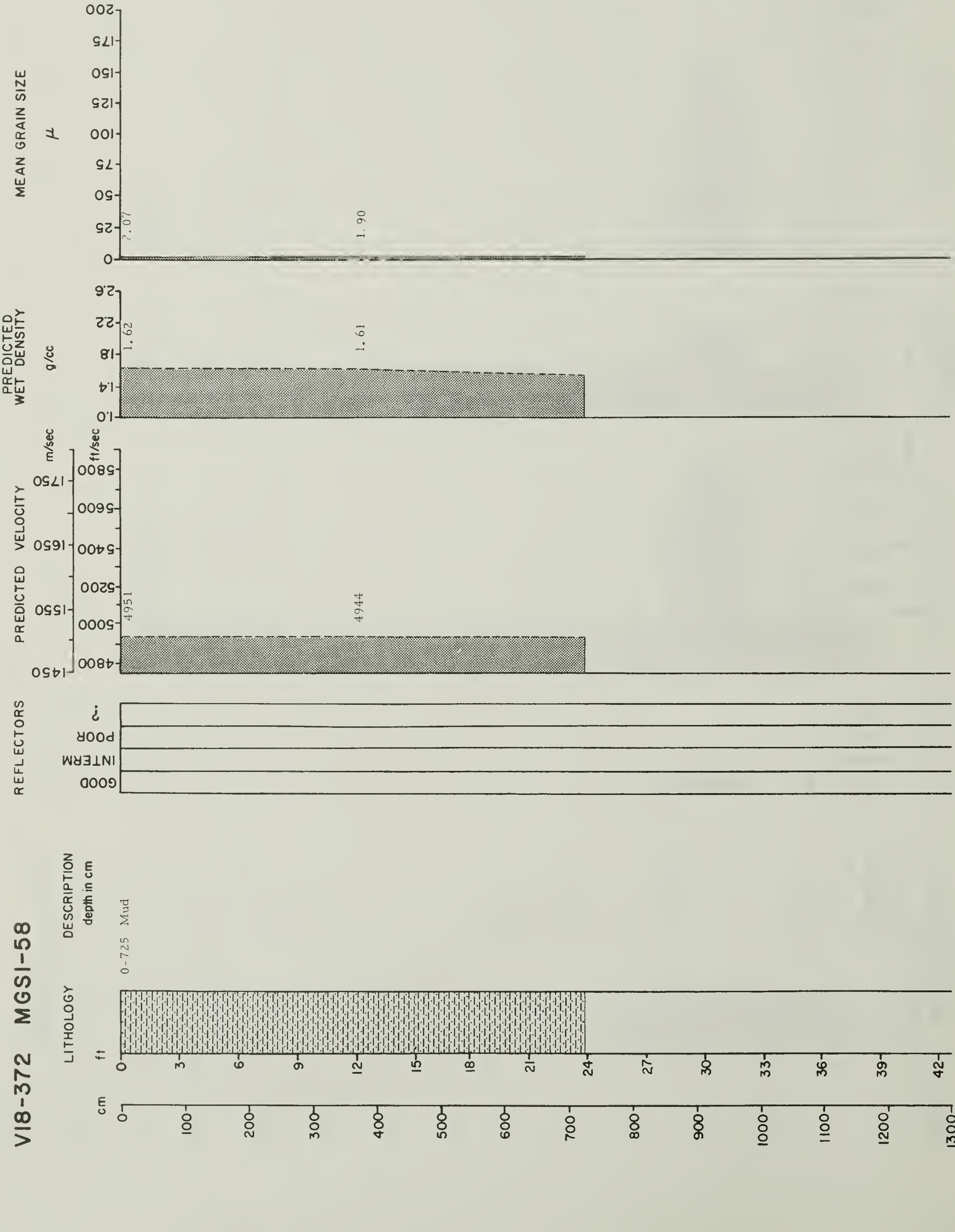
V7-50
MGSI-45
MGSI-49
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-33 Silt, sandy
33-47 Mud
47-57 Silt, sandy
57-66 Mud
66-134 Silt, sandy
134-156 Mud
156-196 Silt, sandy
196-215 Mud, sandy
215-218 Silt
218-245 Mud, sandy
245-490 Sand, silty
REFLECTORS
GOOD
INTERM
POOR
?
R1
R1
R1
R1
R3
R1
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
5556
5556
5556
5556
5556
5600
5722
5883
4938
4938
5017
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
2.05
2.05
2.05
2.05
2.05
2.06
2.11
2.16
1.60
1.60
1.72
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
53.70
63.00
92.90
150.00
1.76
4.03
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42


V7-51 MGSI-50
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-52 Mud
52-232 Graded unit, silt to sand
52-130 Silt, sandy
130-232 Sand
232-234 Silt
234-238 Sand
REFLECTORS
GOOD
INTERM
POOR
?
R1
PREDICTED VELOCITY
m/sec
ft/sec
4931
5569
5712
5863
5569
5925
PREDICTED WET DENSITY
g/cc
1.58
2.05
2.10
2.15
2.05
2.17
MEAN GRAIN SIZE
μ
1.57
56.30
90.00
141.90
168.00

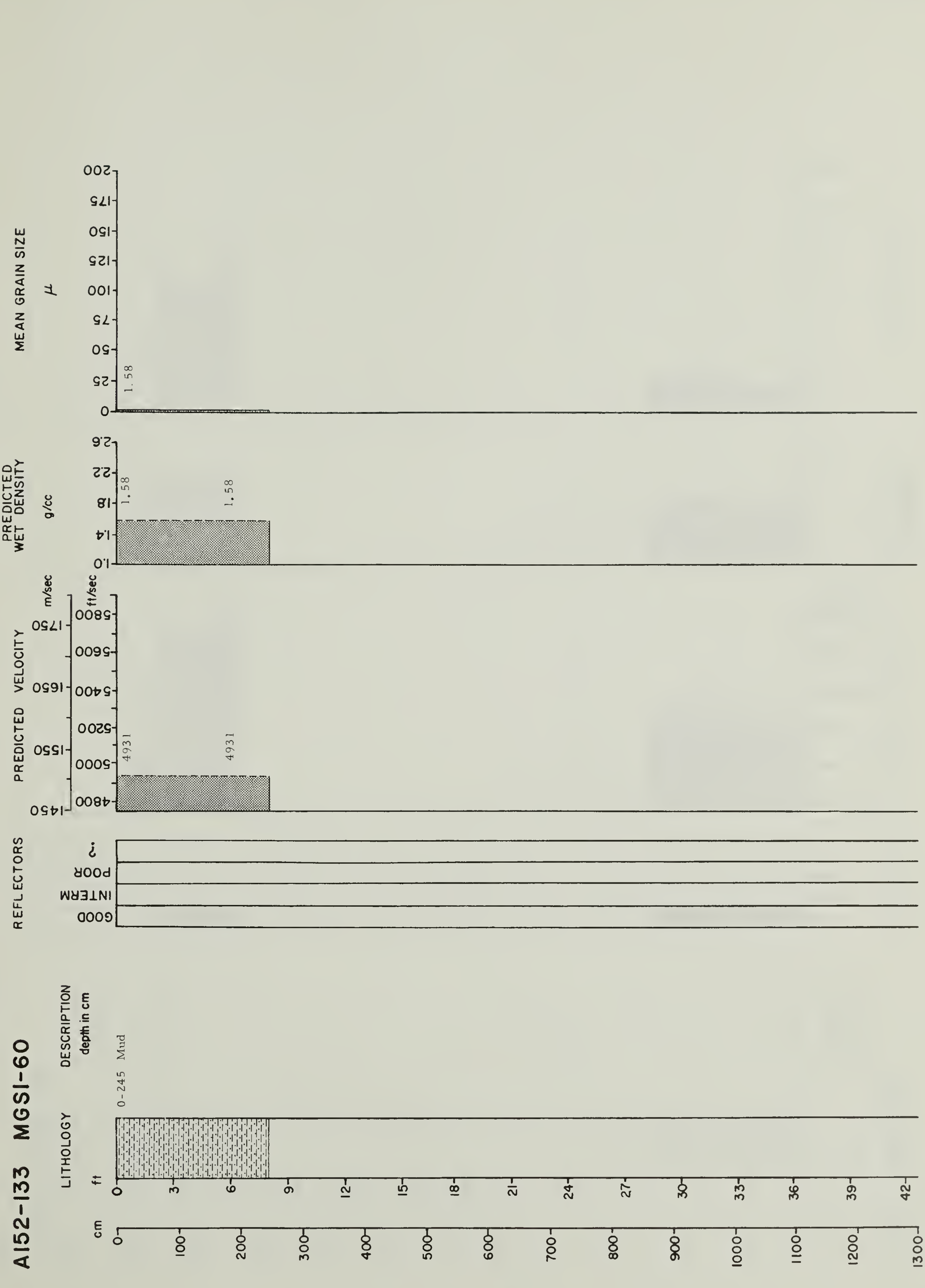

V7-52 MGSI-51
MGSI-61
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-21 Mud
21-46 Graded unit, silt to sand
21-40 Silt
40-46 Sand, silty
46-70 Mud
70-169 Sand, silty
169-236 Mud
236-299 Mud, sandy
299-327 Sand, silty
327-398 Mud
398-439 Graded unit, sandy silt to silty sand
398-420 Silt, sandy
420-439 Sand, silty
439-490 Disrupted, mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
PREDICTED WET DENSITY
g/cc
MEAN GRAIN SIZE
μ


V23-8
MGSI-52
MGSI-96, 98, 99
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-21 Mud
21-42 Silt, sandy
42-57 Mud
57-59 Silt
59-81 Mud
81-83 Silt
83-112 Mud
112-113 Silt
113-1168 Mud interlayered with silt at
180-181, 185-186
220-221
237-238
249-251,
266-267
330-331
420-421
546-547
578-579
595-596
655-656,
659-660
684-686
753-754
780-781
1028-1030
1034-1035
1130-1134 Sand
1155-1158 Sand
1165-1168 Silt
R1
R3
R4
R4
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5524
4943
5111
4943
5150
4943
5974
PREDICTED WET DENSITY
g/cc
2.03
1.61
1.81
1.61
1.84
1.61
2.18
MEAN GRAIN SIZE
μ
48.30
7.66
1.88
9.64
193.80


V18-375 MGSI-53, 54
MGSI-55
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-30 Mud
30-53 Disrupted, silt sandy
53-130 Mud
130-222 Sand, silty
222-242 Sand
242-261 Disrupted, sand, silty
261-340 Mud
R1
R1
R1
R1
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
1450
1550
1650
1750
m/sec
4800
5000
5200
5400
5600
5800
ft/sec
4934
5471
4934
5793
5925
5559
4934
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.59
2.01
1.59
2.13
2.17
2.06
1.59
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
39. 90
114. 70
168. 70
2. 50
1. 65
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

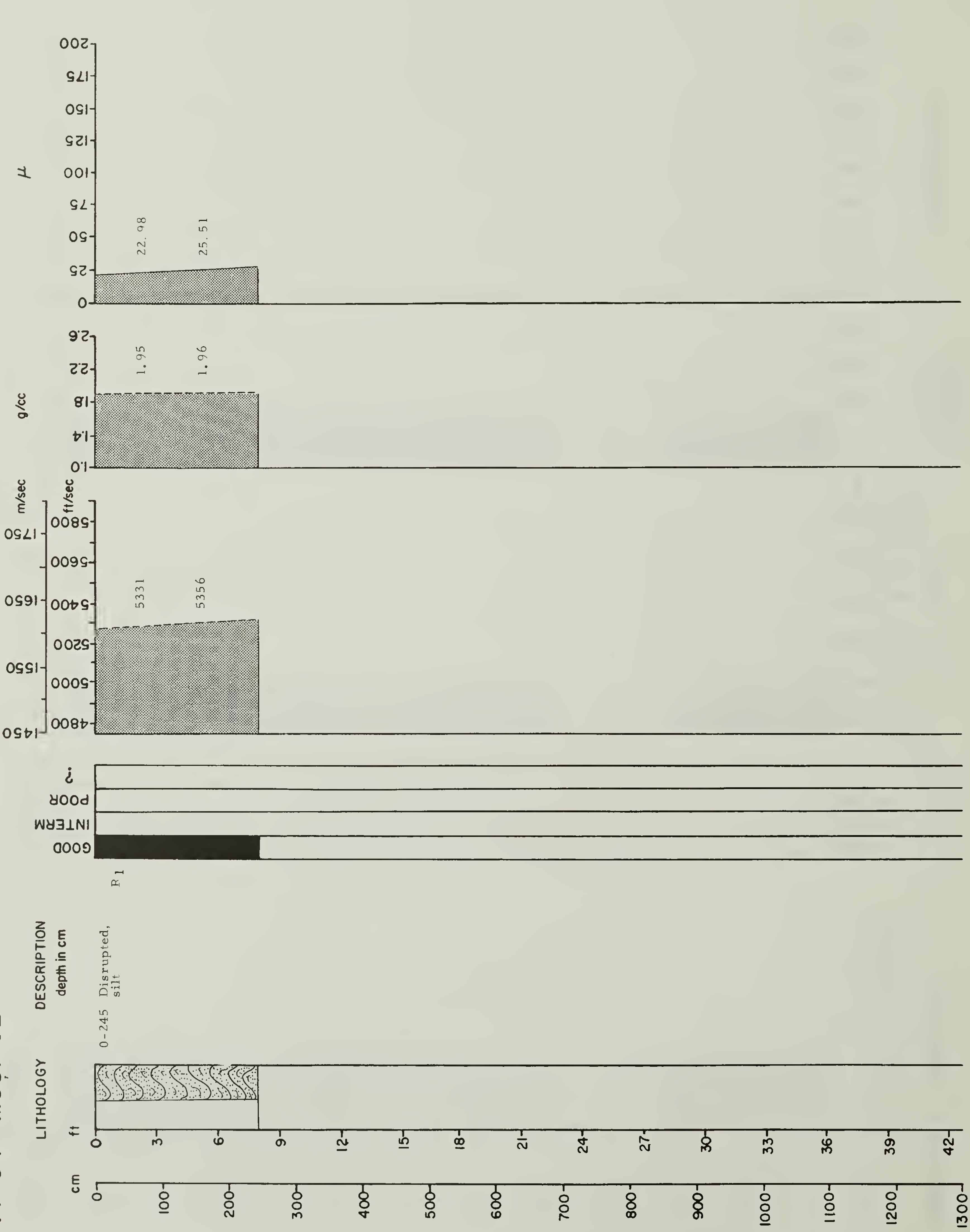


V18-372 MGSI-58
LITHOLOGY
DESCRIPTION
depth in cm
0-725 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450 1550 1650 1750
4800 5000 5200 5400 5600 5800
4951
4944
PREDICTED WET DENSITY
g/cc
1.0 1.4 1.8 2.2 2.6
1.62
1.61
MEAN GRAIN SIZE
μ
0 25 50 75 100 125 150 175 200
7.07
1.90
ft
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42
cm
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300

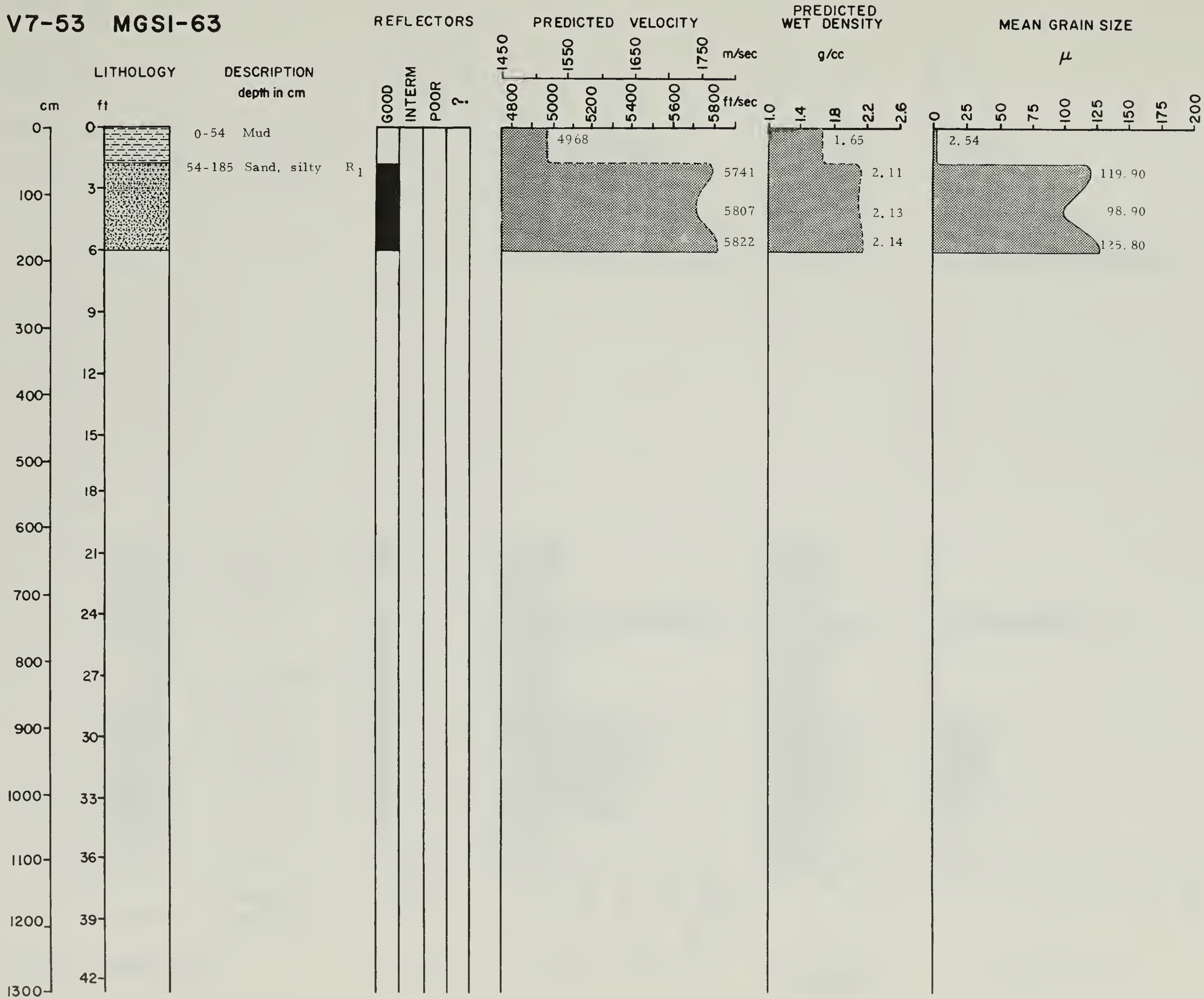


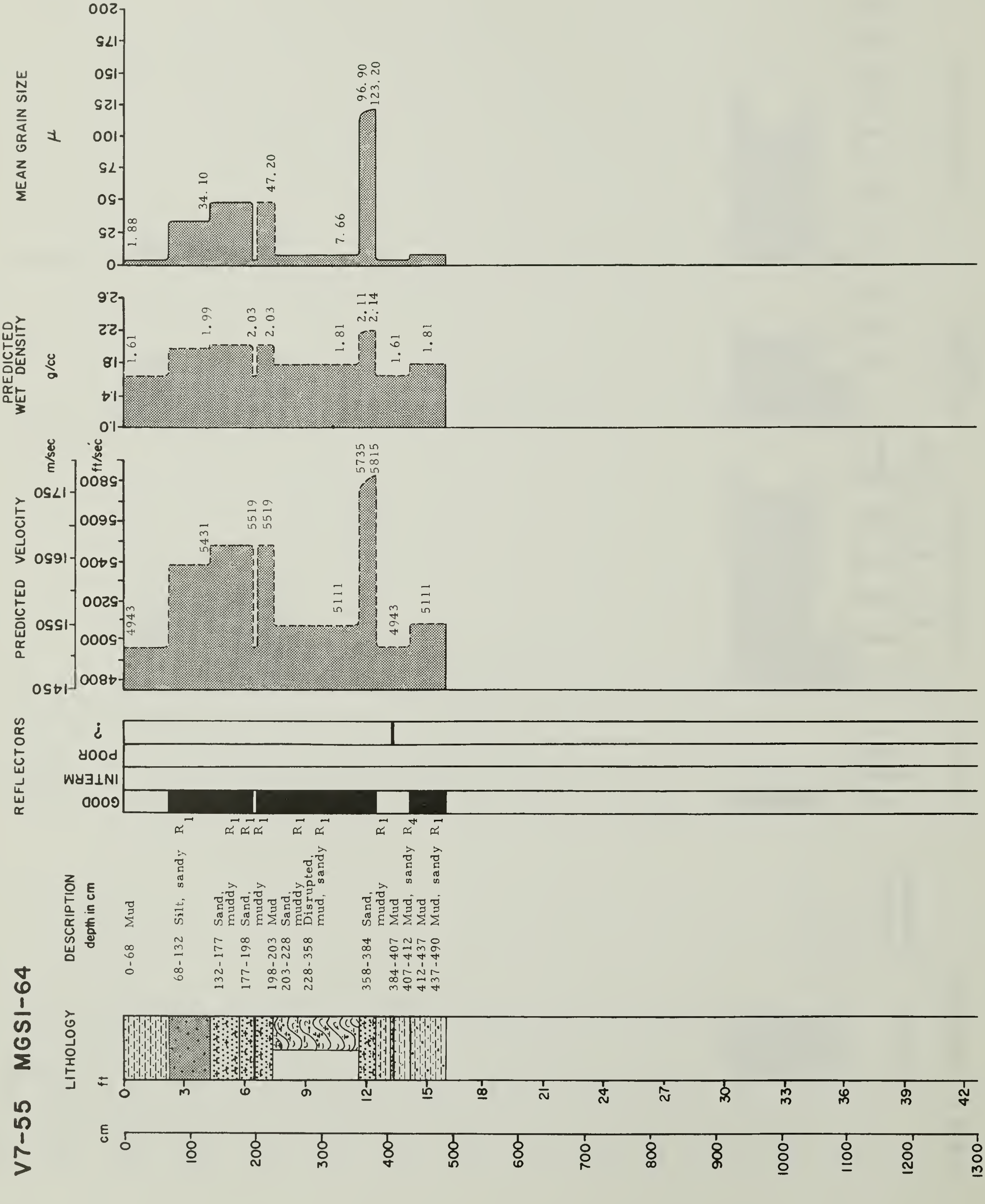
A152-133 MGSI-60
LITHOLOGY
DESCRIPTION depth in cm
0-245 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4931
4931
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.58
1.58
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
1.58
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42

V7-54 MGSI-62

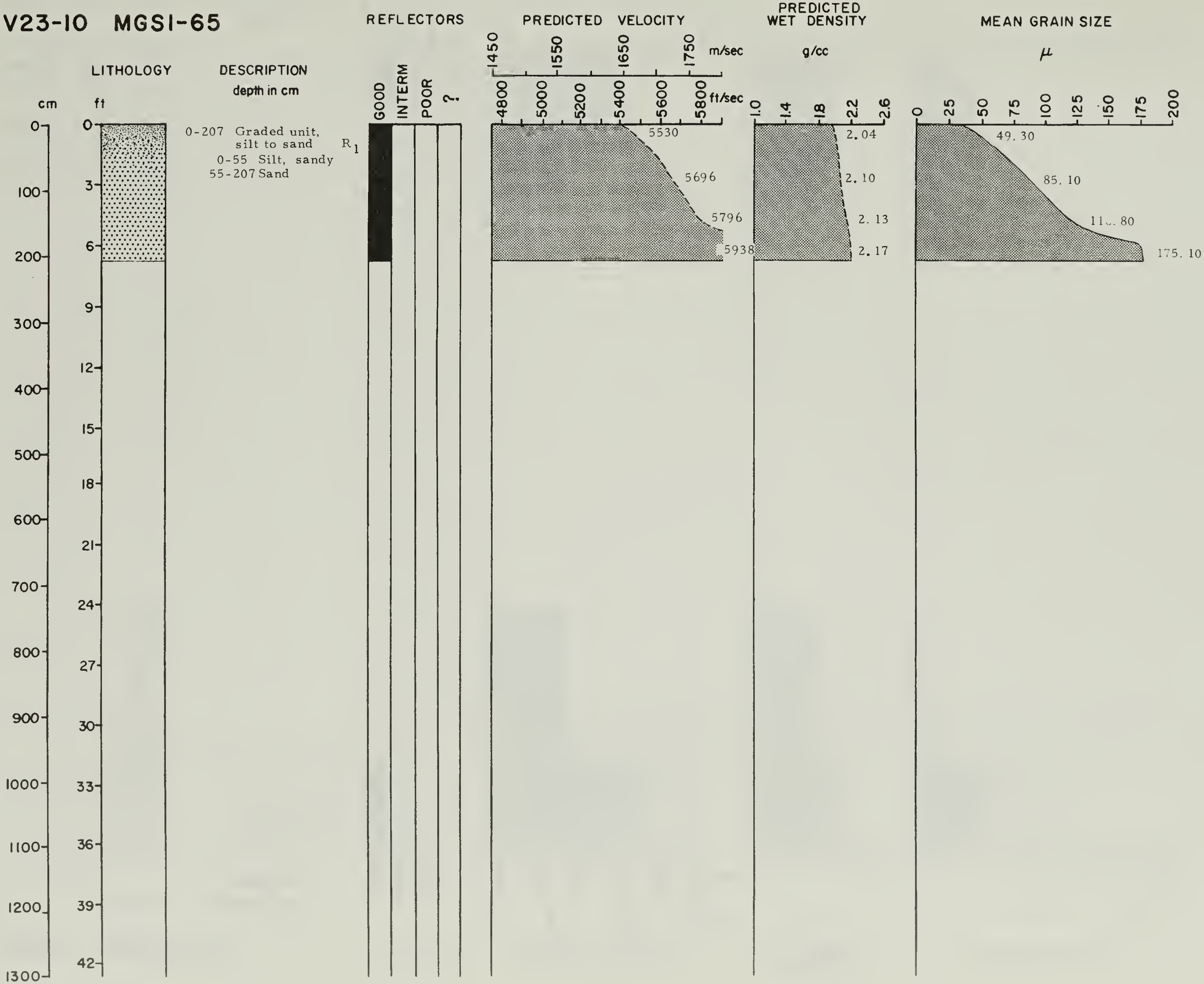


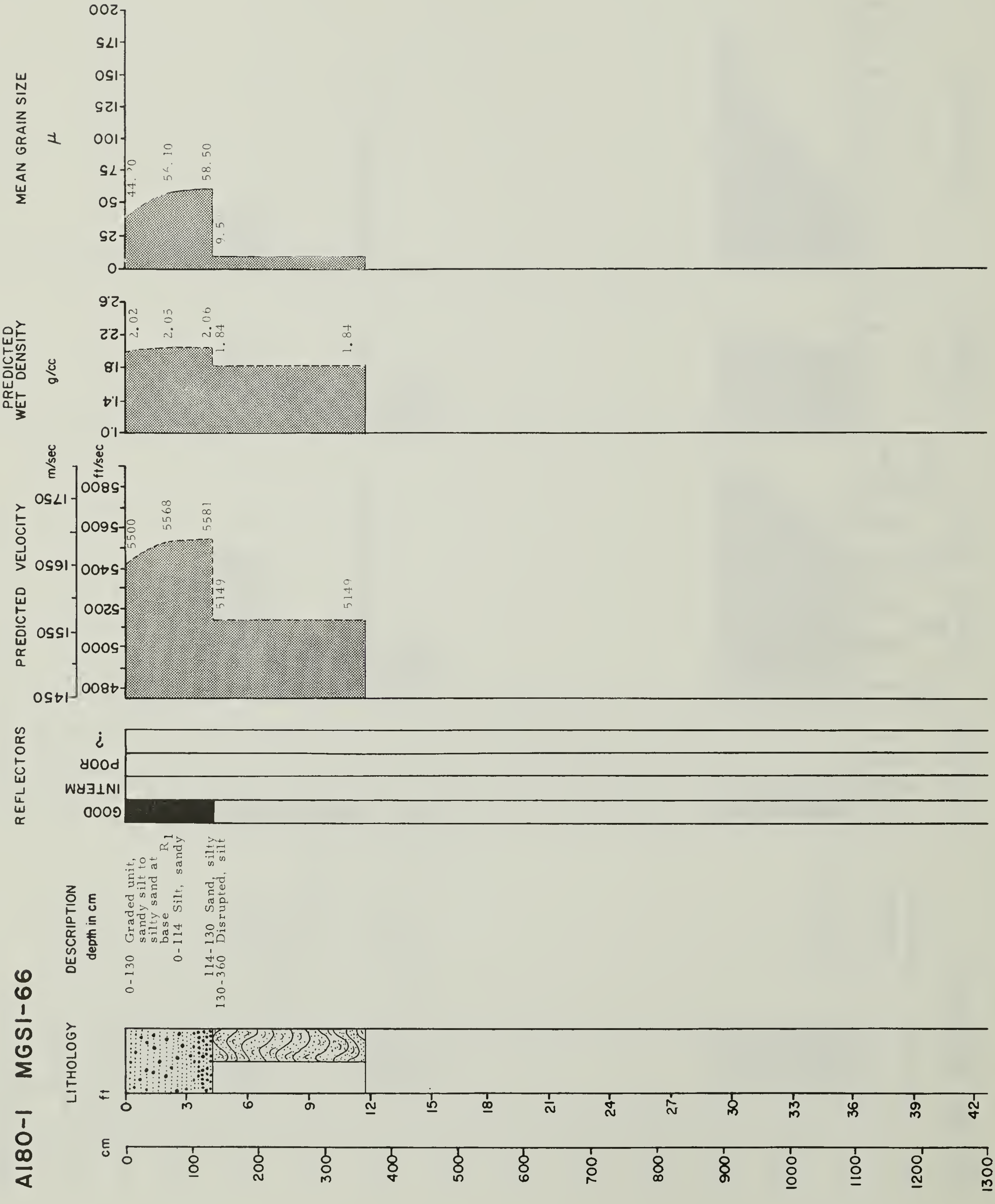
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
LITHOLOGY
DESCRIPTION
depth in cm
0-245 Disrupted, silt
REFLECTORS
GOOD
INTERM
POOR
?
R 1
PREDICTED VELOCITY
m/sec
1450
1550
1650
1750
ft/sec
4800
5000
5200
5400
5600
5800
5331
5356
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.95
1.96
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
22.98
25.51

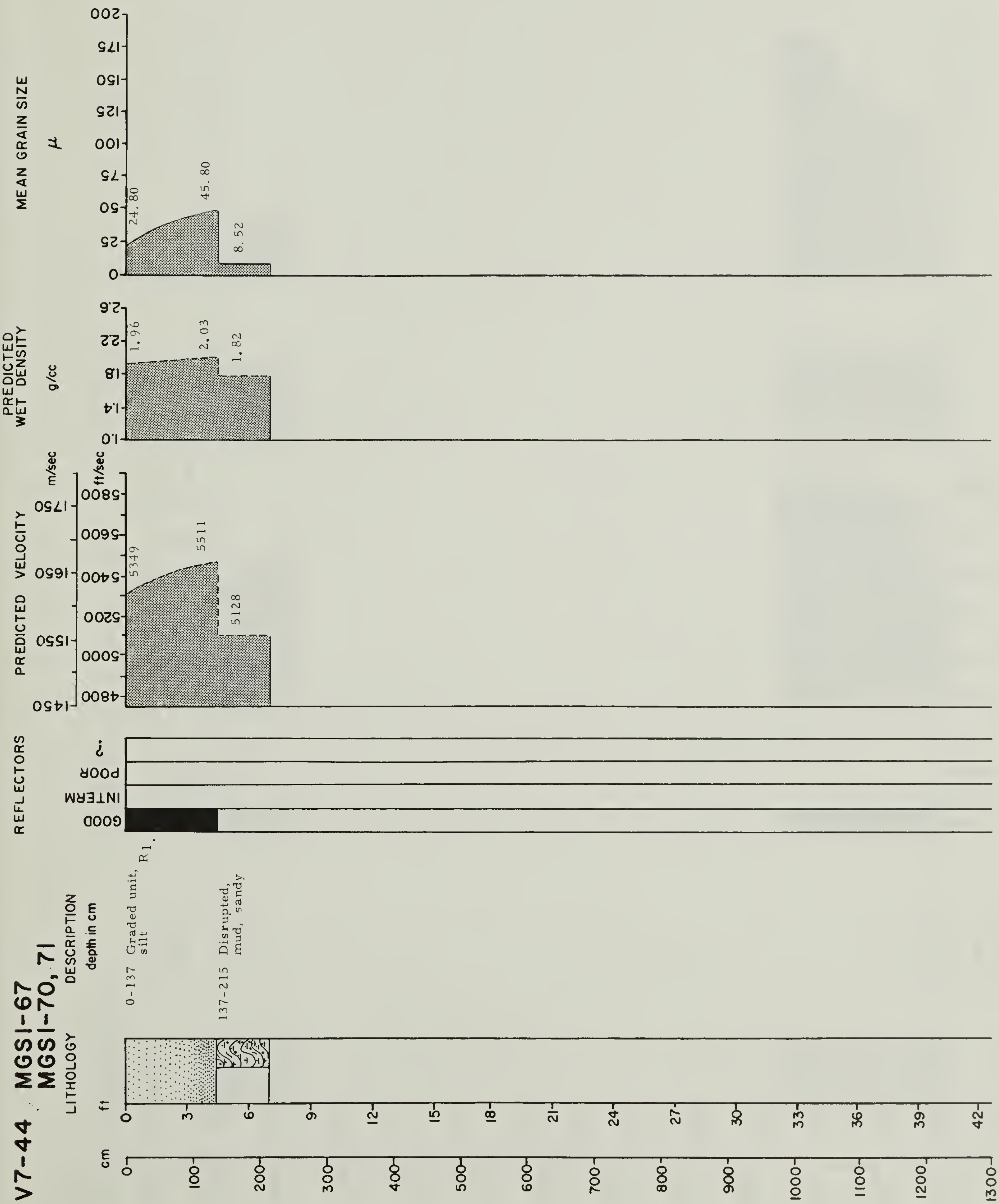

V7-53 MGSI-63
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-54 Mud
54-185 Sand, silty
R1
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4968
5741
5807
5822
PREDICTED
WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.65
2.11
2.13
2.14
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
2.54
119.90
98.90
125.80

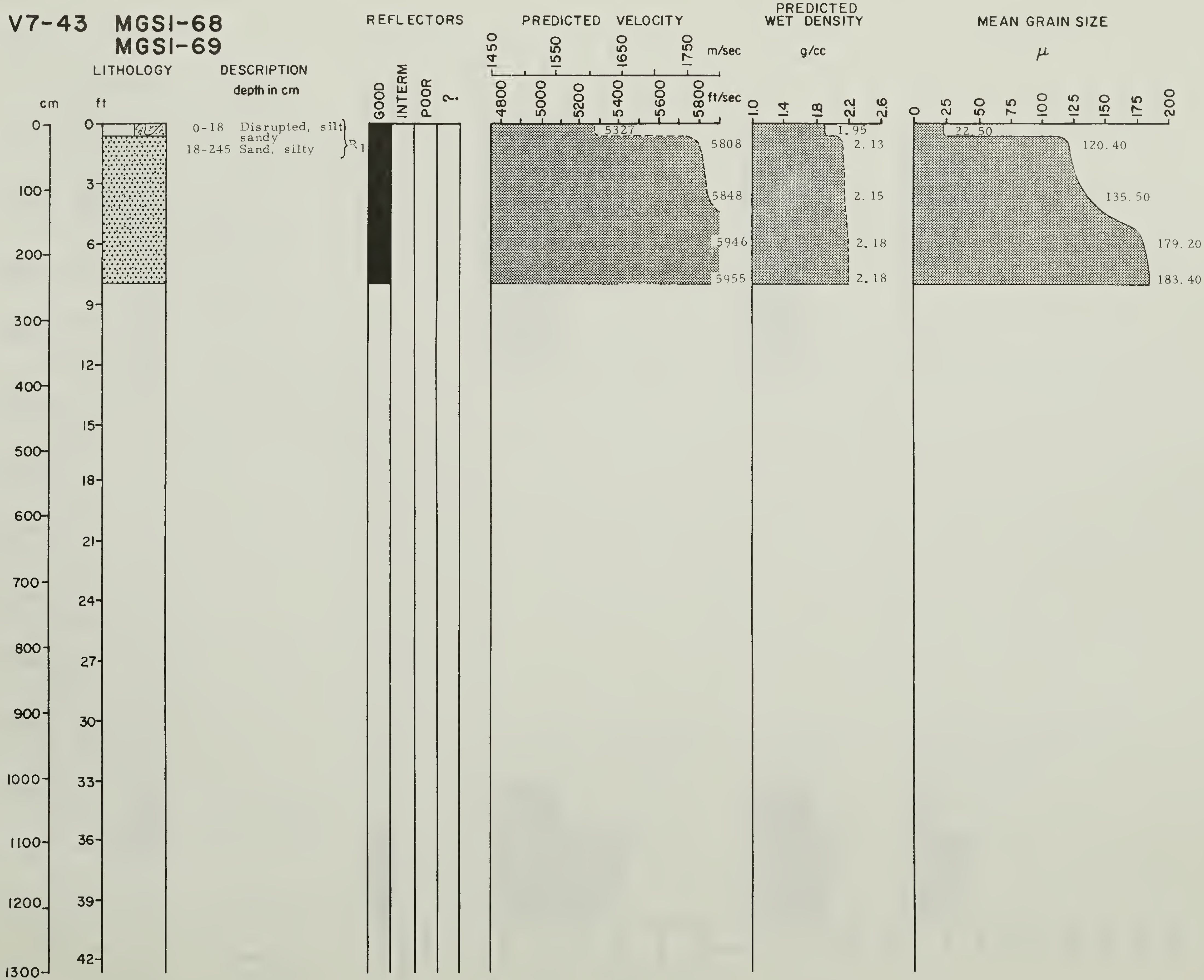

V7-55 MGSI-64
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-68 Mud
68-132 Silt, sandy
132-177 Sand, muddy
177-198 Sand, muddy
198-203 Mud
203-228 Sand, muddy
228-358 Disrupted, mud, sandy
358-384 Sand, muddy
384-407 Mud
407-412 Mud, sandy
412-437 Mud
437-490 Mud, sandy
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
PREDICTED WET DENSITY
g/cc
MEAN GRAIN SIZE
μ

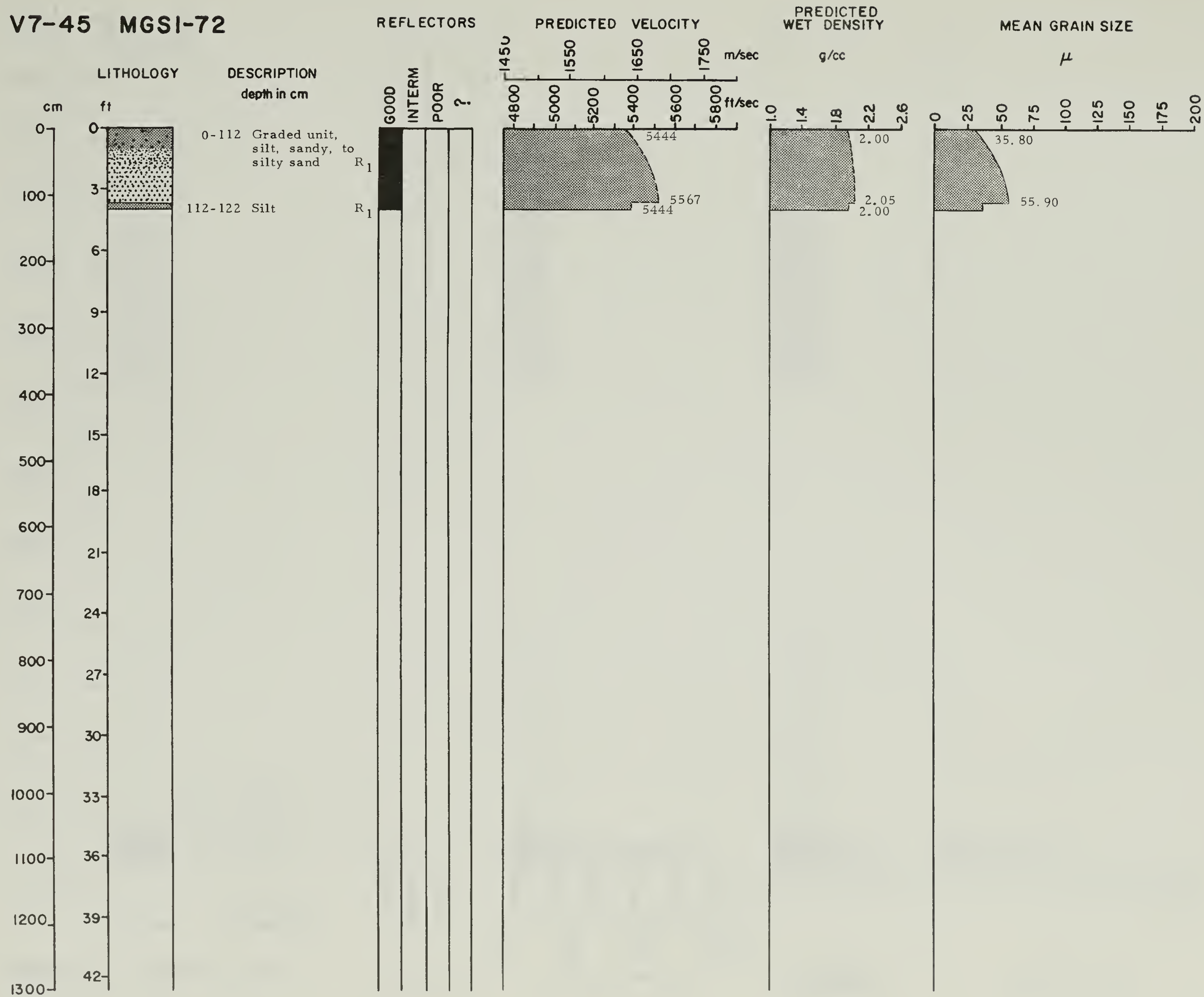
V23-10 MGSI-65




A180-1 MGSI-66
LITHOLOGY
DESCRIPTION
depth in cm
0-130 Graded unit, sandy silt to silty sand at base R1
0-114 Silt, sandy
114-130 Sand, silty
130-360 Disrupted silt
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5500
5568
5581
5149
5149
PREDICTED WET DENSITY
g/cc
2.02
2.05
2.06
1.84
1.84
MEAN GRAIN SIZE
μ
58.50
cm
ft


V7-44 MGSI-67
MGSI-70, 71
LITHOLOGY
DESCRIPTION
depth in cm
0-137 Graded unit, silt
137-215 Disrupted, mud, sandy
REFLECTORS
GOOD
INTERM
POOR
?
R1.
PREDICTED VELOCITY
m/sec
ft/sec
5349
5511
5128
PREDICTED WET DENSITY
g/cc
1.96
2.03
1.82
MEAN GRAIN SIZE
μ
24.80
45.80
8.52
cm
ft


V7-43 MGSI-68
MGSI-69
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-18 Disrupted, silt sandy
18-245 Sand, silty
R1
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
1450
1550
1650
1750
ft/sec
4800
5000
5200
5400
5600
5800
5327
5808
5848
5946
5955
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.95
2.13
2.15
2.18
2.18
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
22.50
120.40
135.50
179.20
183.40


V7-45 MGSI-72
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-112 Graded unit, silt, sandy, to silty sand
112-122 Silt
REFLECTORS
GOOD
INTERM
POOR
?
R1
R1
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
5444
5567
5444
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
2.00
2.05
2.00
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
35.80
55.90
0
100
200
300
400
500
600
700
800
900
1000
1100
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0
3
6
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12
15
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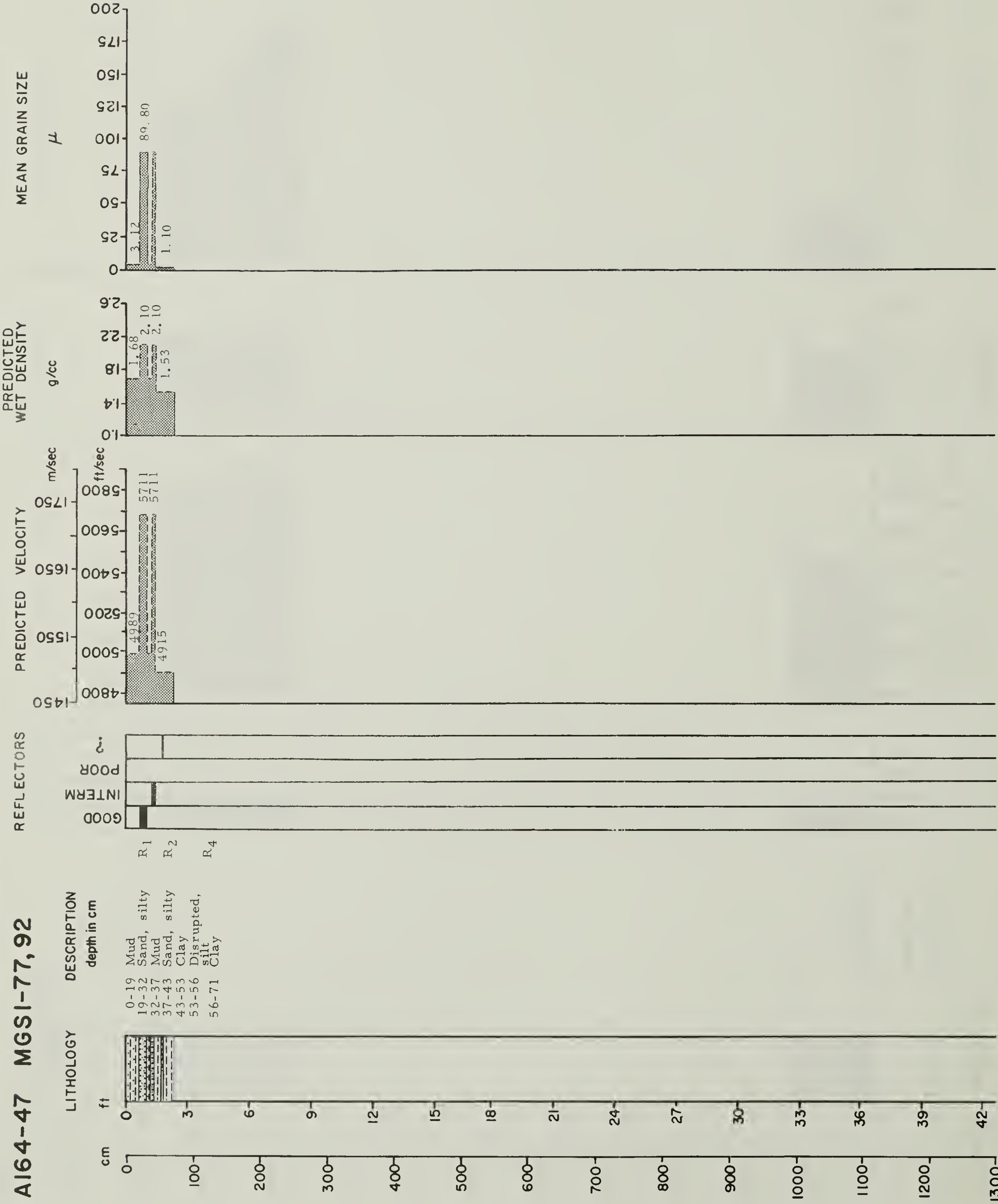
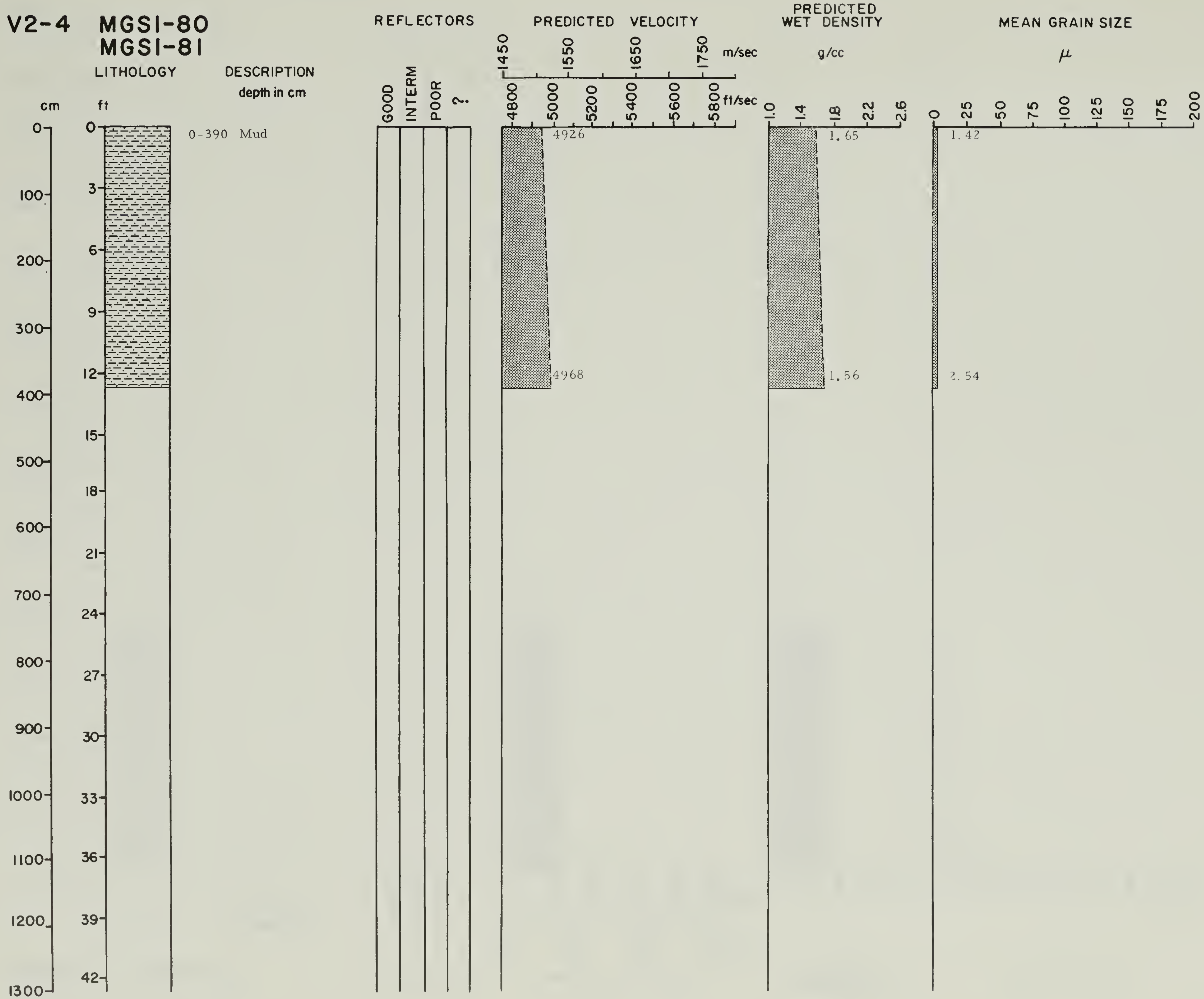
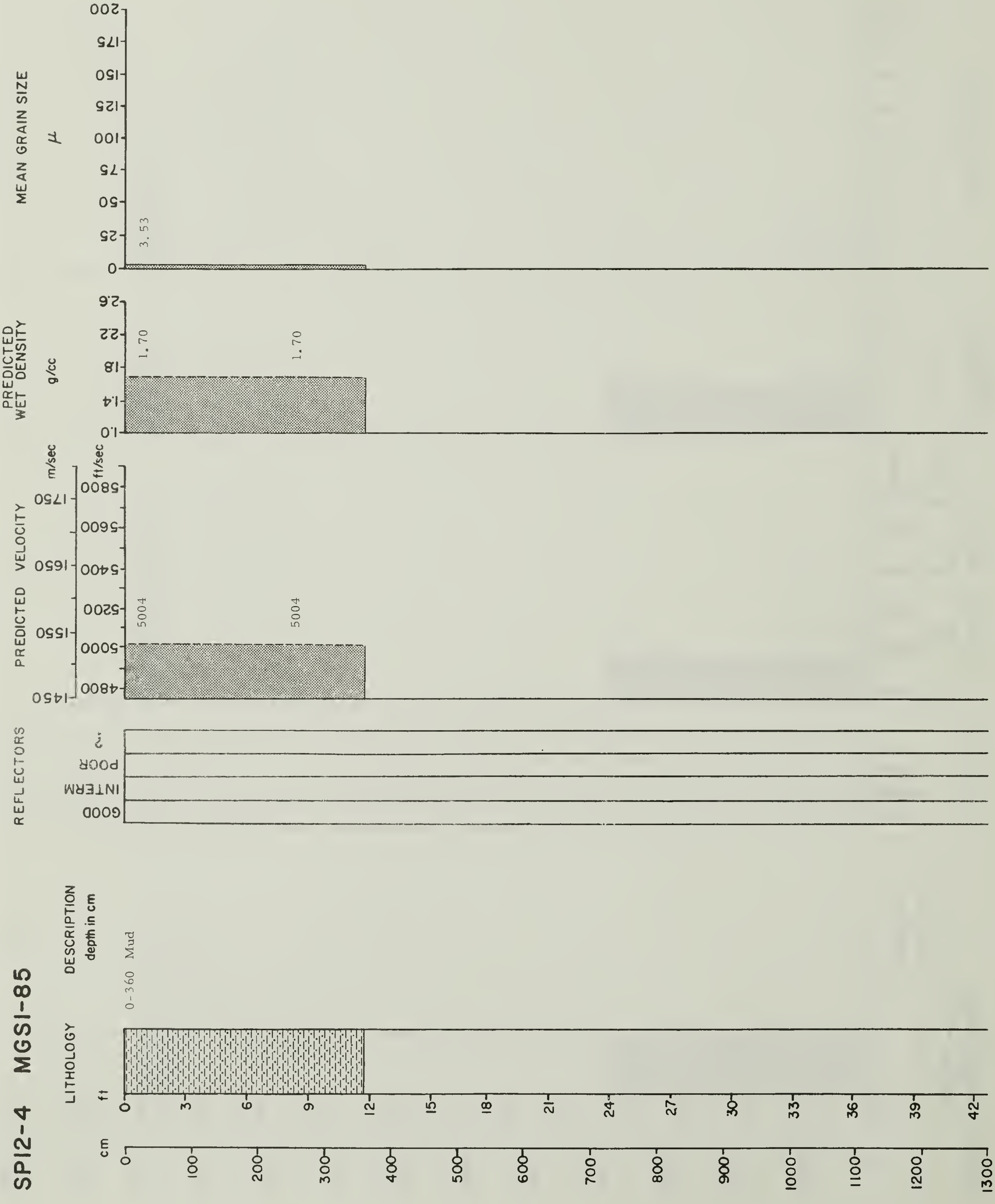
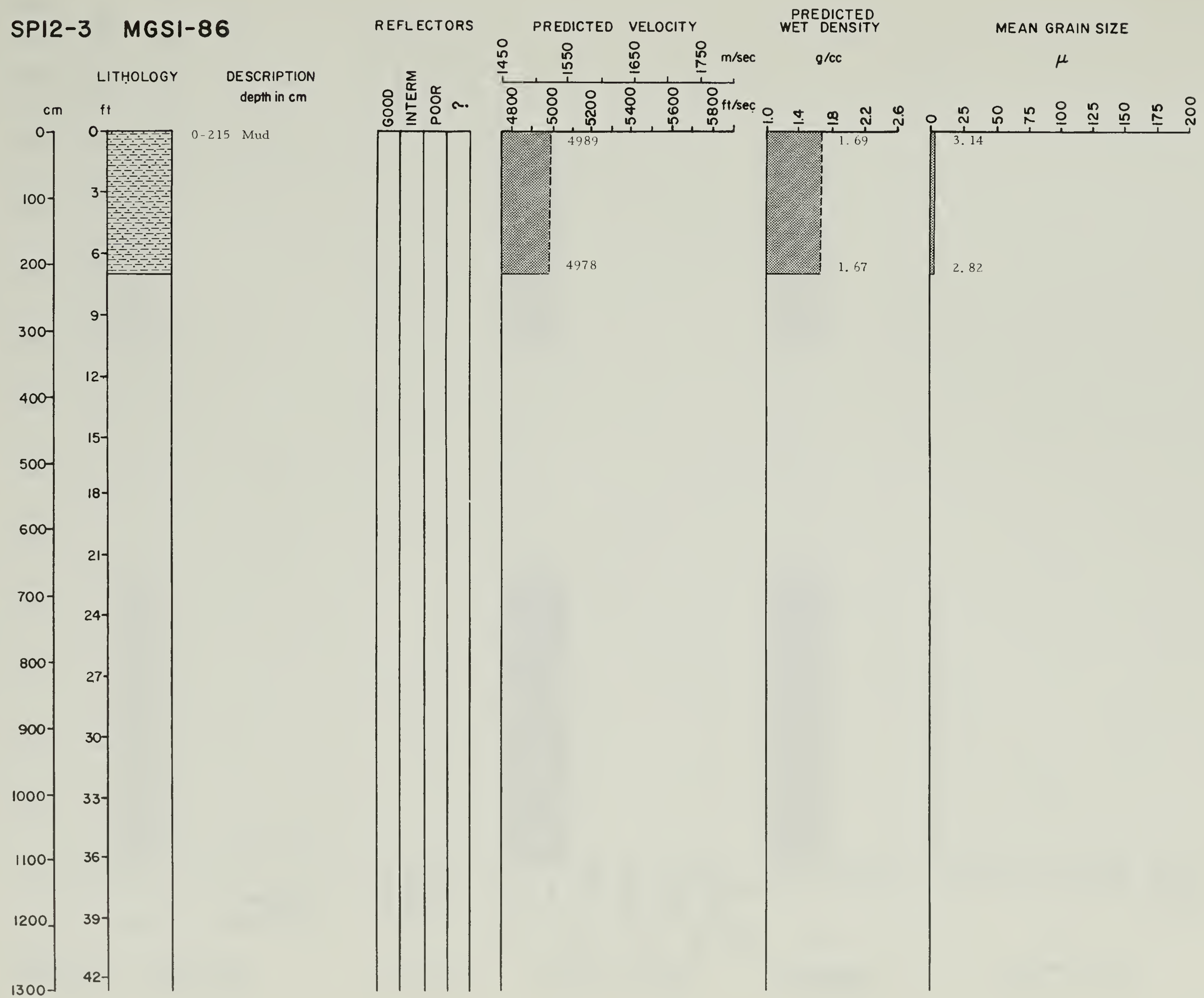
30
33
36
39
42

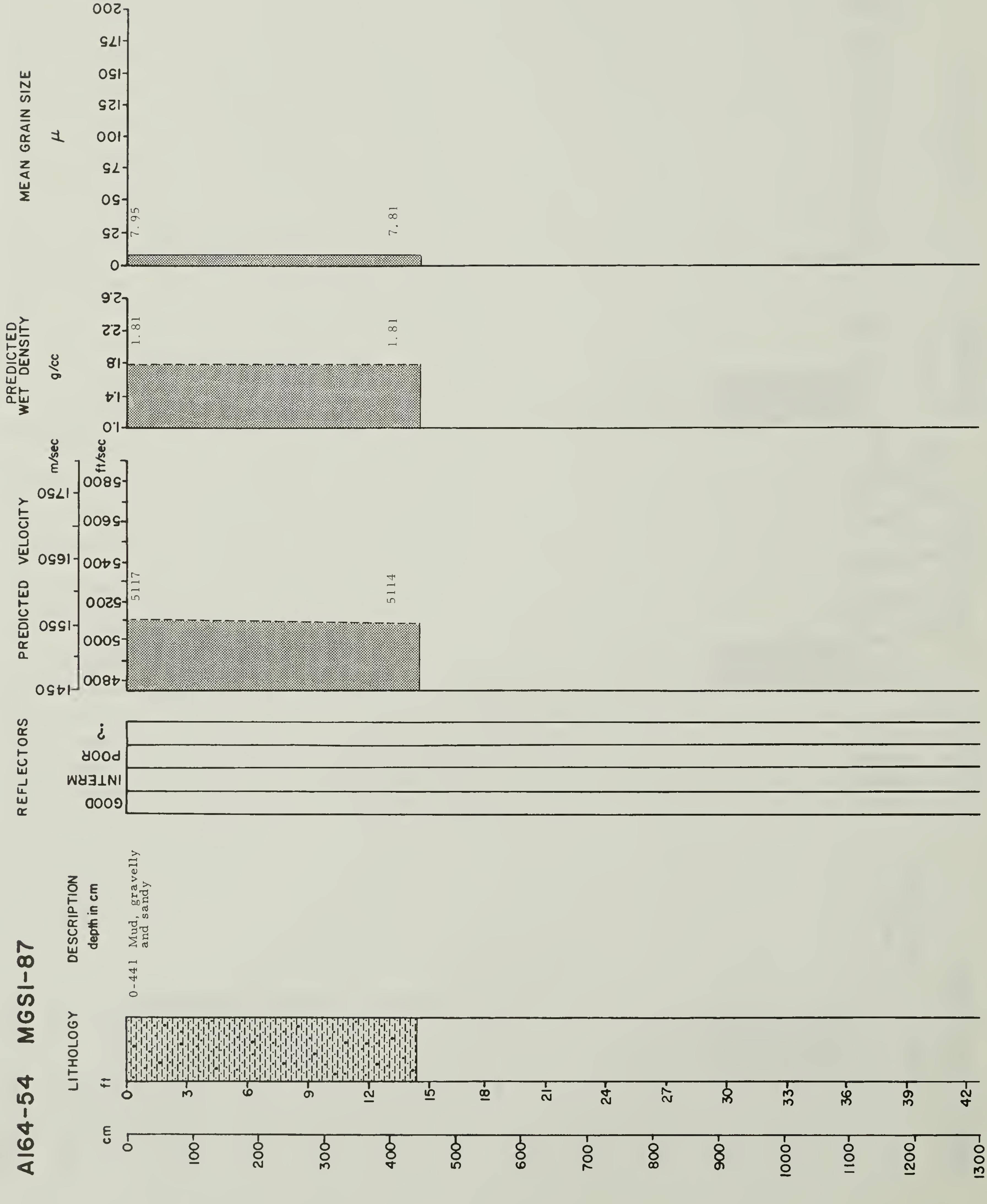

A164-47 MGSI-77, 92
LITHOLOGY
DESCRIPTION
depth in cm
0-19 Mud
19-32 Sand, silty
32-37 Mud
37-43 Sand, silty
43-53 Clay
53-56 Disrupted, silt
56-71 Clay
REFLECTORS
GOOD
INTERM
POOR
?
R1
R2
R4
PREDICTED VELOCITY
m/sec
ft/sec
4989
4915
5711
5711
PREDICTED WET DENSITY
g/cc
1.68
2.10
2.10
1.53
MEAN GRAIN SIZE
μ
3.12
89.80
1.10
cm
ft

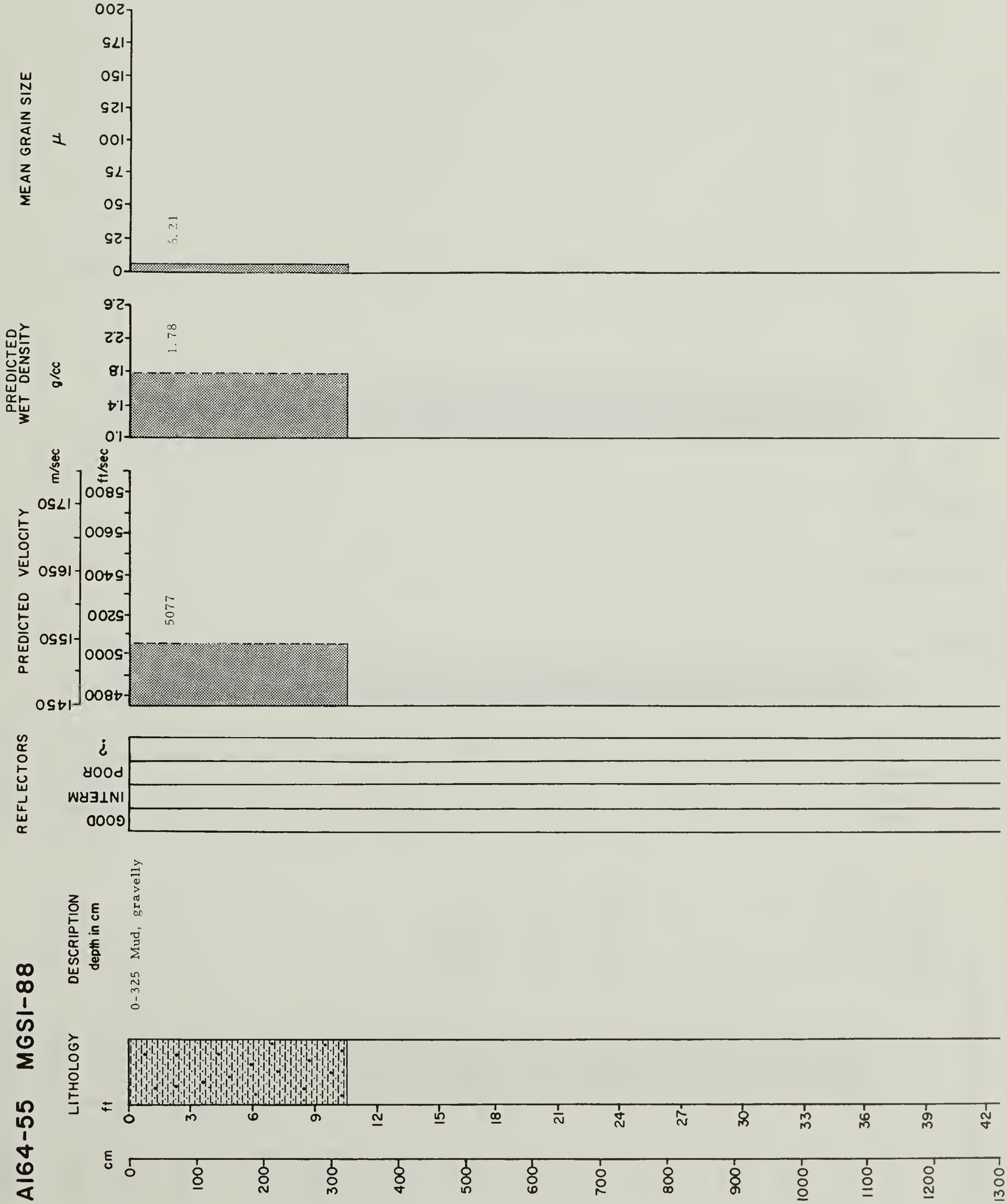

V2-4
MGSI-80
MGSI-81
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-390 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
4926
4968
PREDICTED
WET DENSITY
g/cc
1.65
1.56
MEAN GRAIN SIZE
μ
1.42
2.54

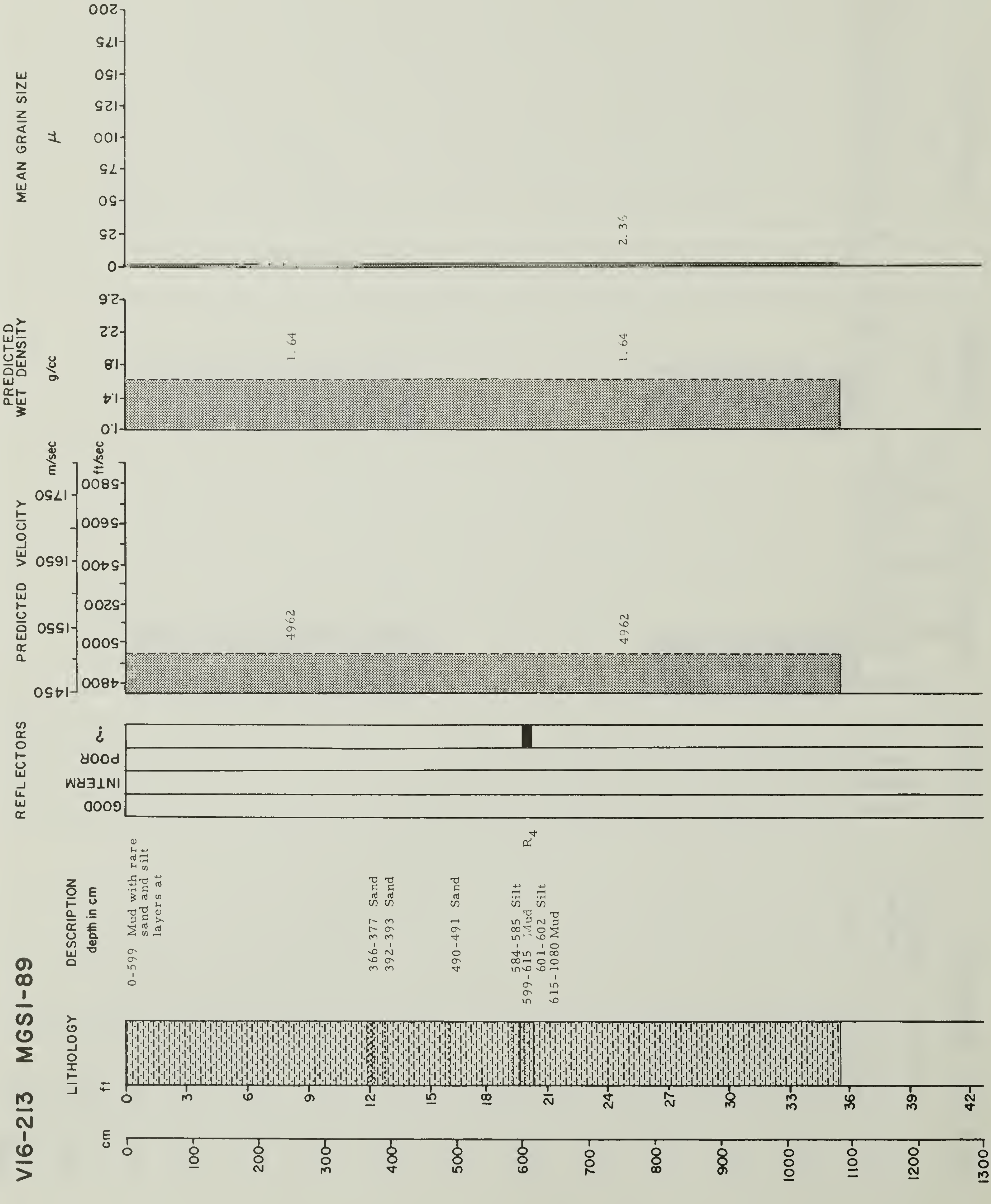

SP12-4 MGSI-85
LITHOLOGY
DESCRIPTION depth in cm
0-360 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450 1550 1650 1750
4800 5000 5200 5400 5600 5800
5004
5004
PREDICTED WET DENSITY
g/cc
1.0 1.4 1.8 2.2 2.6
1.70
1.70
MEAN GRAIN SIZE
μ
0 25 50 75 100 125 150 175 200
3.53
cm
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
ft
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42



SP12-3 MGSI-86
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-215 Mud
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4989
4978
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.69
1.67
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
3.14
2.82


A164-54 MGSI-87
LITHOLOGY
DESCRIPTION
depth in cm
0-441 Mud, gravelly and sandy
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
5117
5114
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.81
1.81
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
7.95
7.81
cm
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
ft
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42


A164-55 MGSI-88
LITHOLOGY
ft
cm
DESCRIPTION
depth in cm
0-325 Mud, gravelly
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5077
PREDICTED WET DENSITY
g/cc
1.78
MEAN GRAIN SIZE
μ
6.21


V16-213 MGS1-89
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-599 Mud with rare sand and silt layers at
366-377 Sand
392-393 Sand
490-491 Sand
584-585 Silt
599-615 Mud
601-602 Silt
615-1080 Mud
R4
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
4962
4962
PREDICTED WET DENSITY
g/cc
1.64
1.64
MEAN GRAIN SIZE
μ
2.35
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
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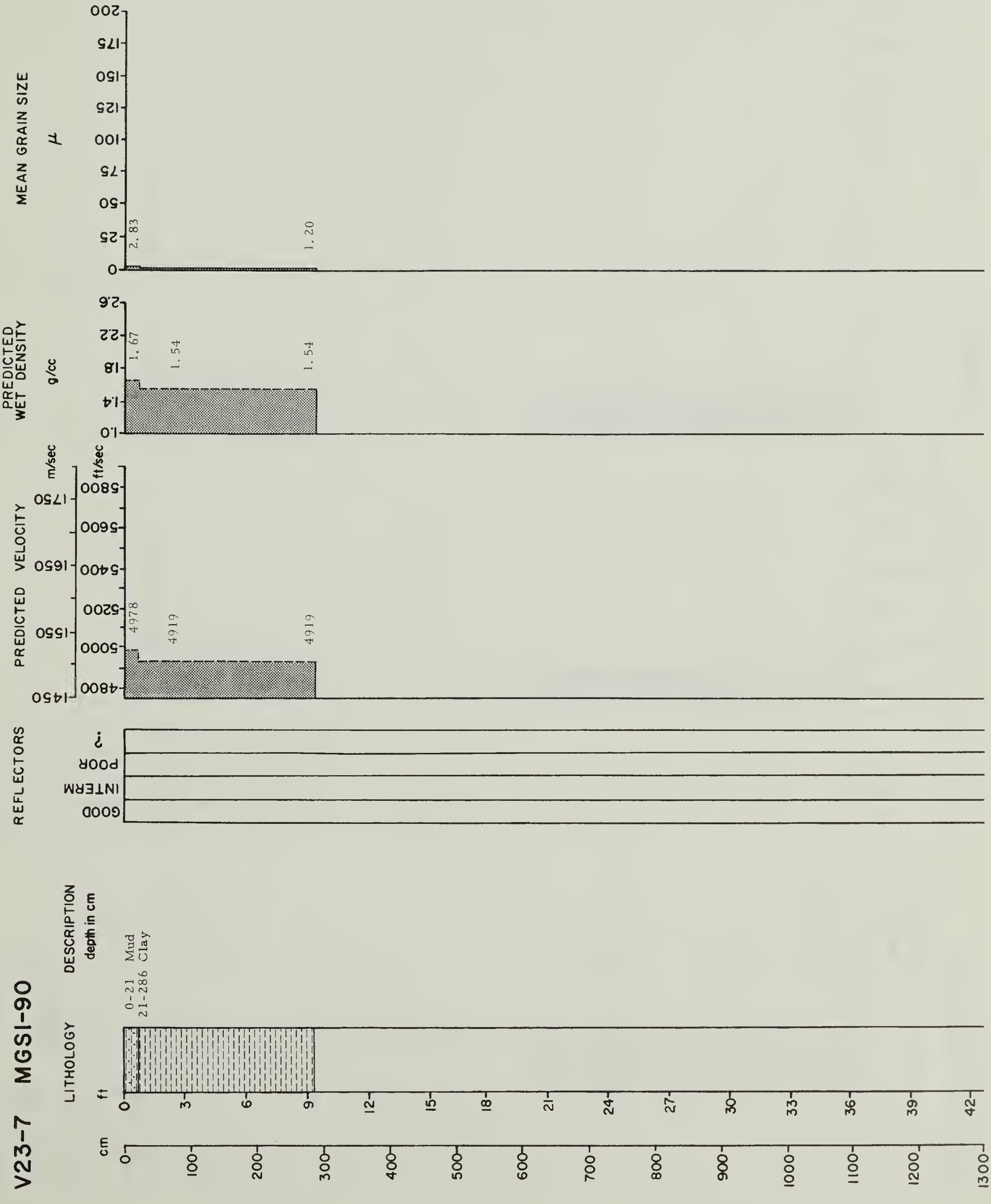
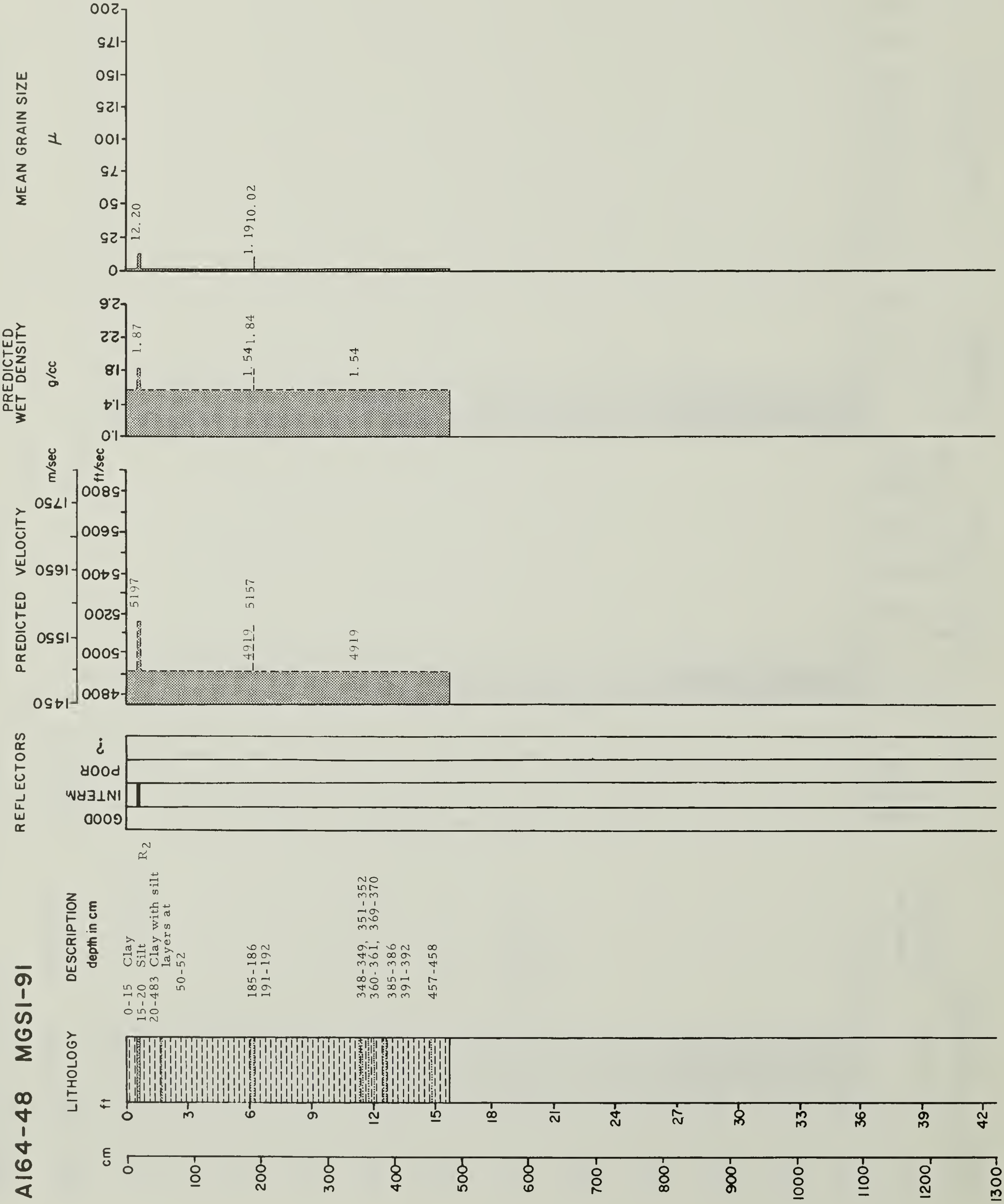
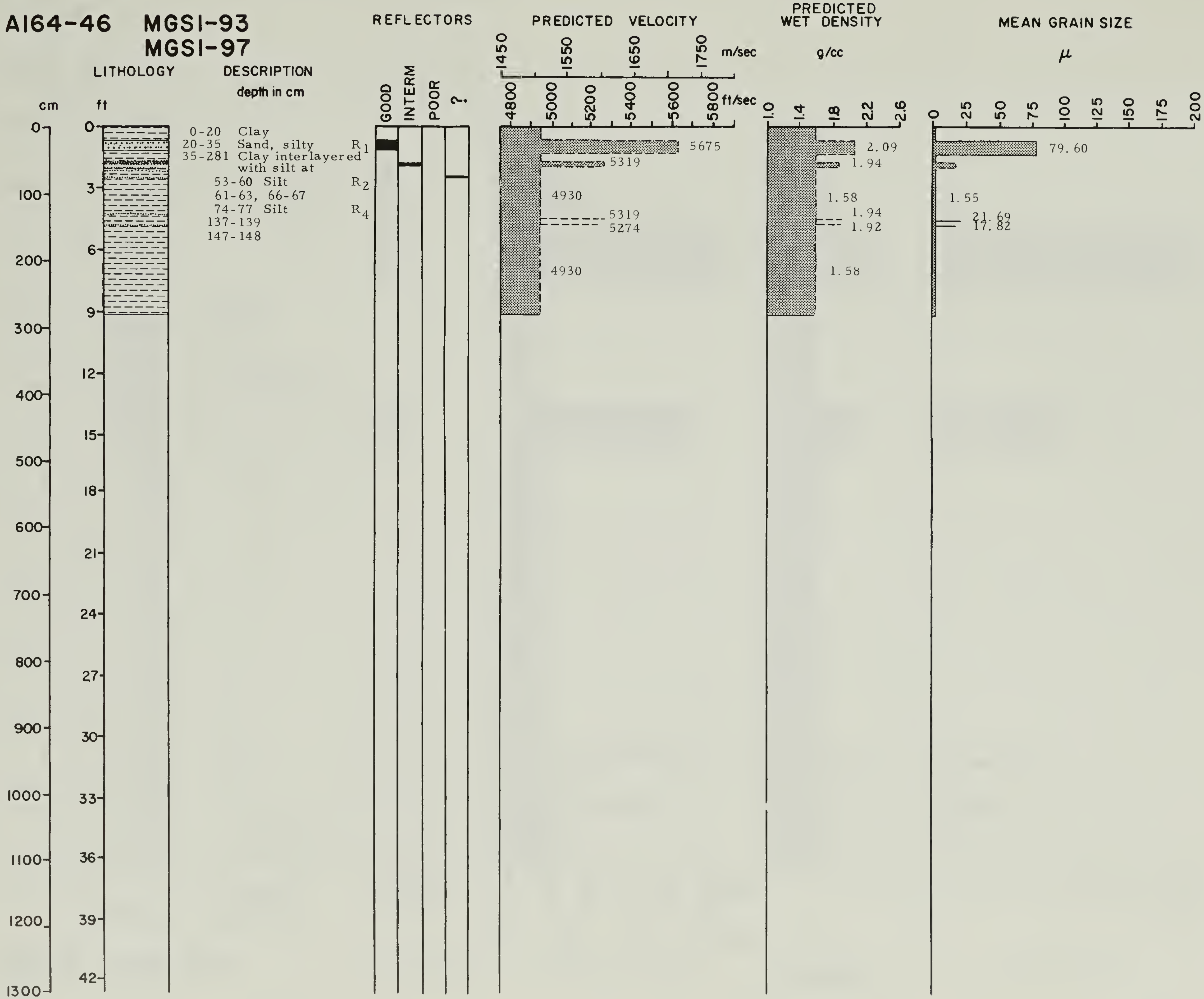
30
33
36
39
42


V23-7 MGSI-90
cm
ft
LITHOLOGY
DESCRIPTION
depth in cm
0-21 Mud
21-286 Clay
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
4978
4919
4919
PREDICTED WET DENSITY
g/cc
1.67
1.54
1.54
MEAN GRAIN SIZE
μ
2.83
1.20


A164-48 MGSI-91
LITHOLOGY
ft
cm
DESCRIPTION
depth in cm
0-15 Clay
15-20 Silt
20-483 Clay with silt layers at
50-52
185-186
191-192
348-349, 351-352
360-361, 369-370
385-386
391-392
457-458
R2
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5197
5157
4919
4919
PREDICTED WET DENSITY
g/cc
1.87
1.54
1.84
1.54
MEAN GRAIN SIZE
μ
12.20
1.19
10.02


A164-46 MGSI-93
MGSI-97
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-20 Clay
20-35 Sand, silty
35-281 Clay interlayered with silt at
53-60 Silt
61-63, 66-67
74-77 Silt
137-139
147-148
R1
R2
R4
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
1450
1550
1650
1750
ft/sec
4800
5000
5200
5400
5600
5800
5675
5319
4930
5319
5274
4930
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
2.09
1.94
1.58
1.94
1.92
1.58
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
79.60
1.55
21.69
17.82
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
3
6
9
12
15
18
21
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30
33
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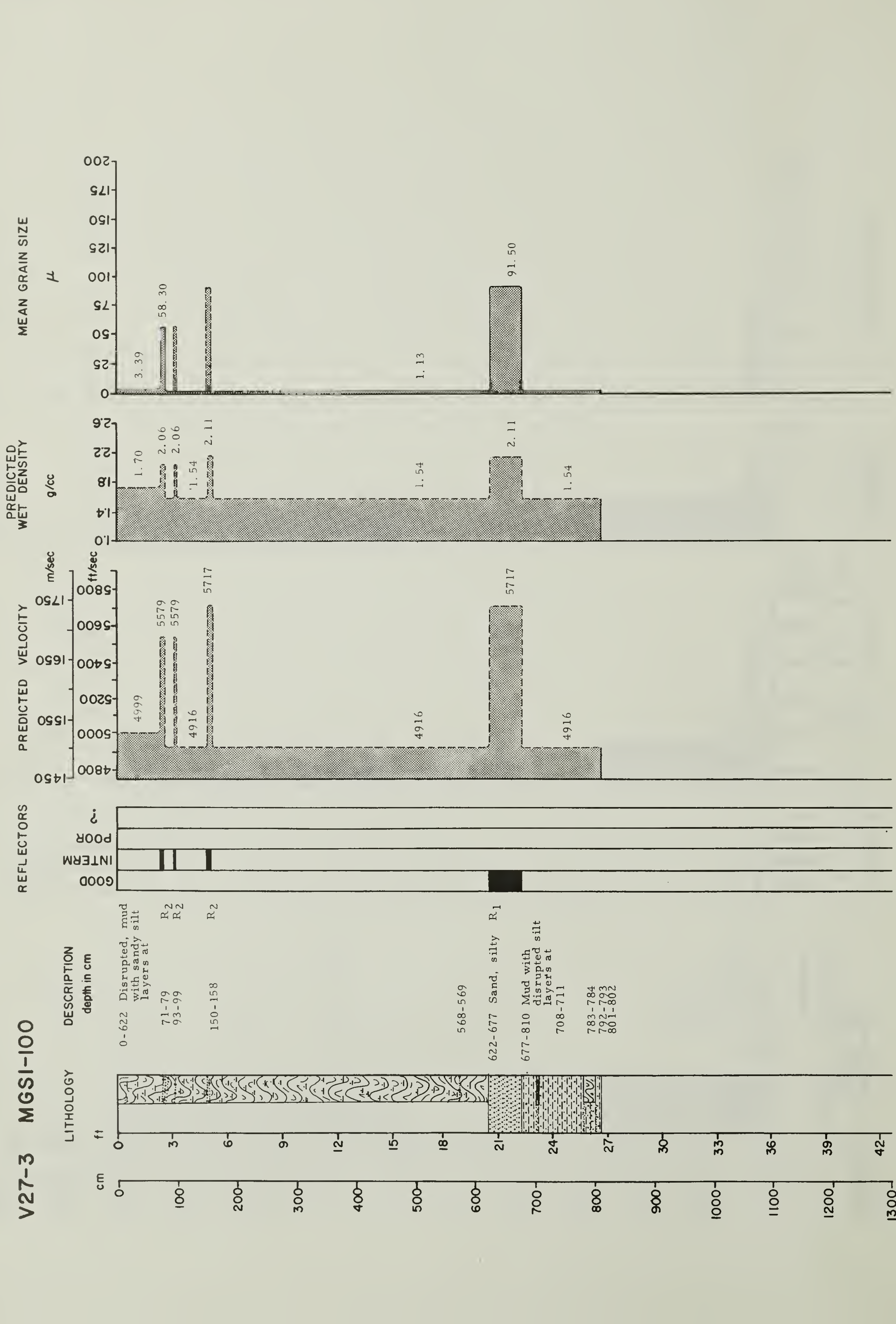
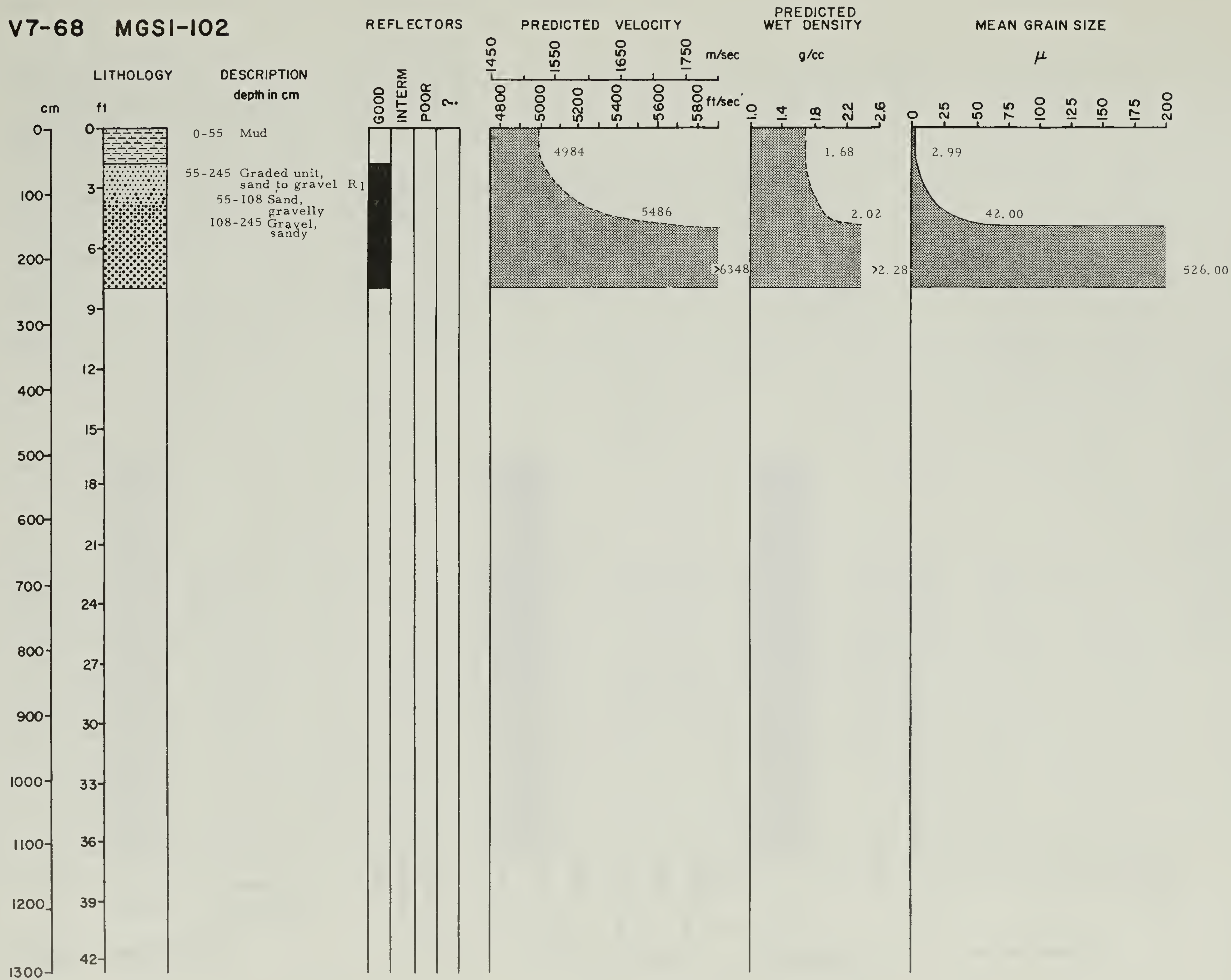
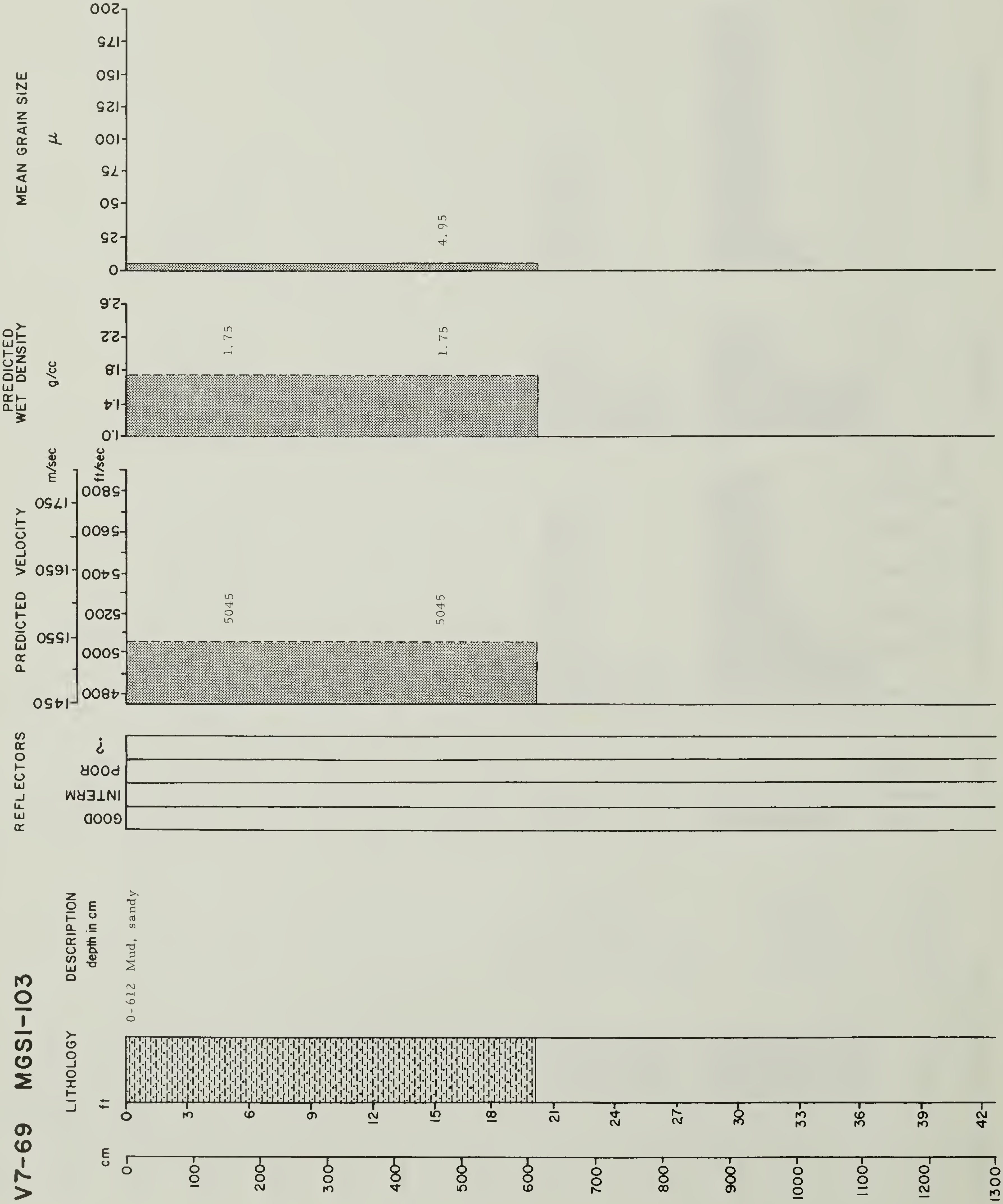
39
42



V27-3 MGSI-100
LITHOLOGY
DESCRIPTION
depth in cm
0-622 Disrupted, mud with sandy silt layers at
71-79 R2
93-99 R2
150-158 R2
568-569
622-677 Sand, silty R1
677-810 Mud with disrupted silt layers at
708-711
783-784
792-793
801-802
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
4999
5579
5579
4916
5717
4916
5717
4916
PREDICTED WET DENSITY
g/cc
1.70
2.06
2.06
1.54
2.11
1.54
2.11
1.54
MEAN GRAIN SIZE
μ
3.39
58.30
1.13
91.50
cm
ft


V7-68 MGSI-102
LITHOLOGY
DESCRIPTION
depth in cm
cm
ft
0-55 Mud
55-245 Graded unit, sand to gravel
55-108 Sand, gravelly
108-245 Gravel, sandy
R1
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
1450
1550
1650
1750
4800
5000
5200
5400
5600
5800
4984
5486
>6348
PREDICTED WET DENSITY
g/cc
1.0
1.4
1.8
2.2
2.6
1.68
2.02
>2.28
MEAN GRAIN SIZE
μ
0
25
50
75
100
125
150
175
200
2.99
42.00
526.00


V7-69 MGSI-103
LITHOLOGY
DESCRIPTION
depth in cm
0-612 Mud, sandy
REFLECTORS
GOOD
INTERM
POOR
?
PREDICTED VELOCITY
m/sec
ft/sec
5045
5045
PREDICTED WET DENSITY
g/cc
1.75
1.75
MEAN GRAIN SIZE
μ
4.95
cm
ft

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Within the Sohm Abyssal Plain sand and coarse silt are major constituents of bottom deposits. These coarse layers are interstratified with clay. High impedence contrasts at the water-sediment interface and at textural breaks within the sediment section favor sound reflection at or immediately below the surface. Multiple sediment reflectors combined with a level sea floor suggest the plain offers an excellent acoustic interface for the reflection of sound. Reflectors are rare or absent in areas of abyssal hills south and east of the plain.

These conclusions are based on inspection and analysis of piston cores. Predictions of sonic properties of individual cores are given. Select cores are matched to locations of acoustic stations completed under the Marine Geophysical Survey Program, U.S. Naval Oceanographic Office.

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GULF OF MAINE
LAURENTIAN CHANNEL
GRAND BANKS
MID-OCEAN CANYON
HEMIPELAGIC MUD AND CLAY
COMPLEX NETWORK OF CHANNEL SANDS AND
INTERCHANNEL HEMIPELAGIC MUD AND CLAY
PREDOMINANTLY CLAY
WITH OCCASIONAL THIN
SILT AND SAND LAYERS
PREDOMINANTLY CLAY
WITH THIN
SILT AND SAND LAYERS
SOHM
ABYSSAL
PLAIN
CLAY
BERMUDA
LENGTH OF CORE
FEET CMS
ROUTE OF SUBMARINE CHANNEL
SILT
SAND
LEGEND
M.G.S. ACOUSTIC STATION
LAMONT CORING SITE NEAREST M.G.S. ACOUSTIC STATION
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FIGURE 5

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FIGURE 4